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DISTRIBUTION OF INTELLIGENCE QUOTIENTS OF TWENTY-TWO THOUSAND PRIMARY-SCHOOL CHILDREN

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Thousands of individual intelligence tests have been given during the past seven or eight years to school children in various cities in the United States. The individual tests most widely used are the Stanford Revision of the Binet-Simon Tests. These tests have been very extensively used in the schools of Kansas City, Missouri, particularly in the primary grades, during the past four years. It is the purpose of this paper to describe the plan by which the tests are given; and to present summaries of test results comparing them with Terman's findings. It is not the purpose to discuss the use made of the test results.

The Stanford Binet Tests in Kansas City are given almost entirely by trained examiners who are kindergarten teachers engaged in teaching half of the day and in giving examinations the other half of the day. This arrangement keeps the examiner in close touch with child life in a normal situation, the schoolroom, so that she does not lose contact with the aims and purposes of the school, nor become automatic and mechanical through the giving of large numbers of tests day after day. This arrangement is highly satisfactory from the standpoint of school organization, since the kindergarten children are in school a half day only. About fifteen teachers are working under this plan. One kindergarten teacher has been giving full time to testing for the past three years. Some of the tests are given by

full-time teachers of first grades, who are relieved of their regular work in the building by substitutes during the weeks required for the testing. Two first-grade teachers work under this plan, testing, however, only the primary children in their own building.

The examiners are chosen for their particular ability in giving tests. A class in technique of testing is organized each year by the psychologist. The course deals not only with the history and significance of the test movement, but much time is given to laboratory work, that is, to demonstration testing. Several practice tests are given by each member of the group, and special conferences on the scoring are held with the psychologist.

After the completion of the course, the members of the class who have shown unusual ability as examiners are encouraged to take a practice course which is entirely individual work under the direction of the psychologist. Forty to fifty individual tests are given under normal conditions, that is, with the examiner and child alone together. After every three or four tests, a special conference of about one hour is held with the psychologist for the purpose of giving help on all questions that arise in giving and scoring the tests. Somewhat less than ten percent of the teachers enrolled in the classes are used as examiners.

Examiners are instructed to give a standardized test, following accurately the directions as found in the Guide for the Stanford Revision of the Binet-Simon Tests. If there is language difficulty because of foreign parentage, the examiners are instructed to make notation of such difficulty on the front of the test blank, but to make no change in the method of examining, such as explaining the meaning of words.

It is the plan in the Kansas City schools to test each child while he is in the kindergarten. At times epidemics of the various contagious diseases and other causes interfere with this plan. Children new to the system, those entering the first grade at the age of six years (without having attended kindergarten), and those who missed the test in the kindergarten, are examined in the first or second grade. When time and the number of trained examiners permit, the new children and the children who may

have missed the tests in the other primary grades are examined in the third grade.

After the tests are completed for a given group, they are sent to the office of the psychologist where they are checked and tabulated. No results are communicated to a teacher or principal by the examiners; these results are given to the principal in tabulated form by the psychologist, with special conferences as to their use if the principal so desires.

The writer will present in this paper only brief and condensed statements of results. The tables will summarize three phases

TABLE I. THE INTELLIGENCE QUOTIENTS OF UNSELECTED WHITE CHILDREN, THREE YEARS ENDING JUNE, 1924

Intelligence Quotients	Kindergarten	First Grade	Second Grade	Entire Group	Terman
(1)	(2)	(5)	(4)	(5)	(6)
56– 65 and below	0.28	0.88	0.78	0.64	0.33
66– 75	1.04	2.85	6.08	2.23	2.3
76– 85	4.97	9.90	14.29	7.78	8.6
86– 95	13.83	25.26	23.99	19.22	20.1
96–105	29.11	33.12	29.16	30.67	33.9
106–115	32.62	19.73	18.83	26.23	23.1
116–125	14.12	6.67	5.37	10.33	9.0
126–135	3.34	1.23	1.20	2.26	2.3
136–145 and above	0.53	0.36	0.14	0.42	0.55
Number of cases	7,474	5,576	1,413	14,463	905
Median	105.7	98.9	97.1	102.27	100.4

of primary testing as found at Kansas City; first, unselected white children, probably representative of the whole population of Kansas City; second, colored primary children; and third, children of foreign parentage, mainly Italian.

Tables I and II, giving summaries of unselected white children, represent a total of 20,526 children. All children indicated as "foreign" by examiners at the time of examination, and all children enrolled in the three markedly foreign schools of Kansas City—Karnes, Emerson, and Adams—were excluded from these tables. In this way it was hoped to make a summary

representative of a purely American type of child. Table I represents all children qualifying under the above conditions tested in Kansas City up to the end of the school year June, 1924 (three years), while Table II summarizes the tests for the school year 1924-25. In each table a comparison is made with Terman's distribution of intelligence quotients by percents.[1]

Tables III and IV summarize the test results for colored children for the three years ending June, 1924, and the school year 1924-25. A comparison with Terman's findings is made in each table. Table V summarizes the results for Karnes School

TABLE II. THE INTELLIGENCE QUOTIENTS OF UNSELECTED WHITE CHILDREN, SCHOOL YEAR 1924-25

Intelligence Quotients	Kinder-garten	First Grade	Second Grade	Third Grade	Entire Group	Terman
(1)	(2)	(3)	(4)	(5)	(6)	(7)
56– 65 and below	0.71	1.72	1.04	3.15	1.19	0.53
66– 75	1.80	3.18	3.96	9.01	3.00	2.3
76– 85	4.94	12.44	11.27	22.30	9.01	8.6
86– 95	14.22	27.92	26.10	25.00	20.16	20.1
96–105	32.67	32.94	32.36	25.68	32.16	33.9
106–115	30.52	15.00	18.69	13.06	23.67	23.1
116–125	12.25	5.60	5.85	1.13	8.84	9.0
126–135	2.33	1.11	0.52	0.68	1.63	2.3
136–145 and above	0.56	0.07	0.21	.....	0.35	0.55
Number of cases	3,214	1,447	958	444	6,063	905
Median	104.2	96.8	97.7	92	100.7	100.4

and children designated as foreign in all other schools of Kansas City except the Adams and Emerson, for the three years ending June, 1924. The enrollment in the Karnes School is made up largely of the children of parents of foreign extraction, mainly Italian.[2] We have no data on the percent of parents born in

[1] Terman, Lewis M. *The Measurement of Intelligence.* New York, Houghton Mifflin Company, 1916. p. 66.

[2] The principal of the school gives the following estimate of the type of population: Italian, 90 percent; Jewish, 7 percent; Mexican, 1 percent; floating white type, 2 percent.

TABLE III. THE INTELLIGENCE QUOTIENTS OF COLORED CHILDREN, THREE YEARS ENDING JUNE, 1924

Intelligence Quotients	Kinder-garten	First Grade	Second Grade	Entire Group	Terman
(1)	(2)	(3)	(4)	(5)	(6)
56– 65 and below	1.00	4.79	12.81	3.45	0.33
66– 75	4.02	7.72	10.25	6.07	2.3
76– 85	15.10	21.69	38.47	19.54	8.6
86– 95	24.49	31.62	17.95	27.26	20.1
96–105	33.90	21.33	12.82	26.93	33.9
106–115	16.45	11.39	5.13	13.47	23.1
116–125	4.03	0.74	.....	2.30	9.0
126–135	0.67	0.74	2.56	0.82	2.3
136–145 and above	0.33	.....	.....	0.16	0.55
Number of cases	298	272	39	609	905
Median	96.79	91.3	80.3	93.45	100.4

TABLE IV. THE INTELLIGENCE QUOTIENTS OF COLORED CHILDREN, SCHOOL YEAR 1924-25

Intelligence Quotients	Kinder-garten	First Grade	Second Grade	Third Grade	Entire Group	Terman
(1)	(2)	(3)	(4)	(5)	(6)	(7)
56– 65 and below	3.60	8.77*	8.33*	31.25*	5.87	0.33
66– 75	3.96	10.52	8.33	37.50	6.67	2.3
76– 85	12.95	31.58	33.33	18.75	17.07	8.6
86– 95	33.10	28.07	41.67	12.50	32.00	20.1
96–105	29.48	15.79	8.33	.....	24.80	33.9
106–115	13.31	3.50	.....	.....	10.66	23.1
116–125	3.60	1.75	.....	.....	2.93	9.0
126–135	.....	.....	.....	.....	.....	2.3
136–145 and above	.....	.....	.....	.....	.....	0.55
Number of cases	278	57	24	16	375	905
Median	94	85.4	86	71	91.8	100.4

* The number of cases in the second grade, Table III, and in the first, second, and third grades, Table IV, is so small that the percents are unreliable. In fact a large percent of the cases tabulated in the second and third grades, Table IV, was examined because of slowness in school work.

this country. A large proportion of the children, however, were born in this country, most of them in Kansas City.

The Tables I to V summarize test results for all primary children tested regularly in the Kansas City schools, except the children of the Emerson and Adams Schools. The children of

these schools are of foreign extraction. Test results of Karnes in Table V show the general trend of results in this type of school.

Figure 1 shows graphically the comparison of Kansas City white children and Kansas City colored children with Terman's 905 unselected children (data summarized in Table I and Table III, three years ending June, 1924). Figure 2 shows graphically

TABLE V. THE INTELLIGENCE QUOTIENTS OF FOREIGN CHILDREN, SCHOOL YEAR ENDING JUNE, 1924

	Intelligence Quotients									
	55 and Below	56–65	66–75	76–8 5	86–95	96–105	106–115	116–125	Number Cases	Median I. Q.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Karnes										
Kindergarten	2	4	20	37	34	19	1	0	117	81.8
First grade	3	21	62	73	73	20	0	0	252	81.5
Second grade	1	13	14	9	3	1	0	0	41	79.6
Total.....	6	38	96	119	110	40	1	0	410	81.5
Percents..	1.46	9.25	23.41	29.02	26.84	9.76	0.24	.....	.....	.....
Foreign	5	4	14	22	14	4	1	0	64	80.1
Percents..	7.82	6.25	21.87	34.38	21.87	6.25	1.56	.....	.....	.....
Foreign in all schools	15	26	54	95	112	45	20	3	370	85.5
Percents..	4.05	7.03	14.59	25.68	30.27	12.16	5.41	0.82	.....	.....

the comparison of Kansas City white children and Kansas City colored children with Terman's 905 unselected children (data summarized in Tables II and IV, year 1924-25). Lack of space prevents discussing the foregoing results. The writer desires, however, to call attention to several points.

First, an examination of the tables shows higher medians for kindergarten children than for other primary children. The kindergarten groups are probably not altogether unselected. Chil-

dren are admitted to the kindergarten at the age of five, but attendance is not compulsory. The writer does not feel that the higher kindergarten medians are a result of the character of the Stanford Binet Tests. An examination of Kuhlman's *A Further Revision and Extension of the Binet-Simon Scale*, published in 1922, shows several primary tests moved to the next

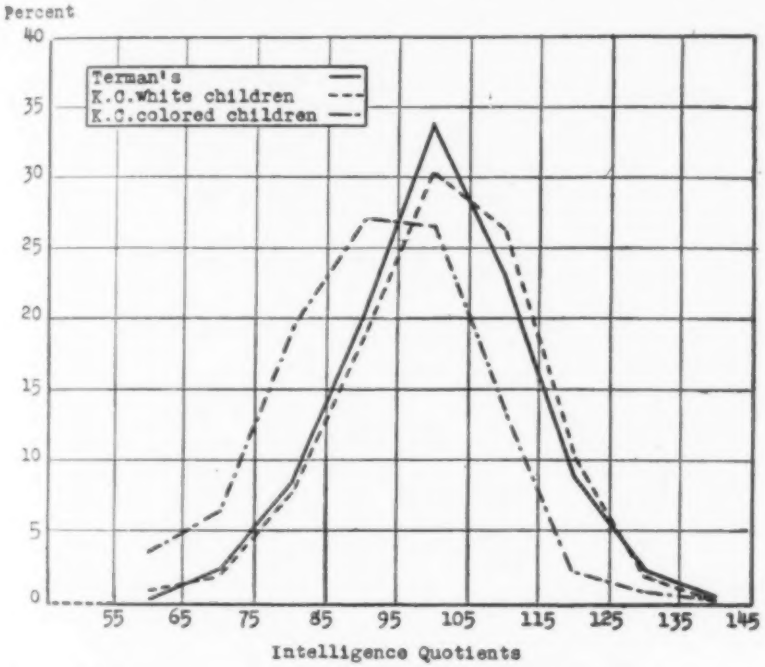

FIGURE 1. INTELLIGENCE QUOTIENTS FOR 14,463 WHITE PRIMARY CHILDREN, FOR 609 COLORED PRIMARY CHILDREN, AND FOR TERMAN'S 905 UNSELECTED WHITE CHILDREN

higher year; for example, counting four pennies is placed in the fifth year instead of the fourth year as in the Stanford Revision. Of course it is not possible to make a statement of more than suggestive value here, but small children tested with the new Kuhlman Revision in all probability would not test lower than if tested with the Stanford Revision. The only accurate means of making a comparison with Terman's curve would be to do so by chronological age rather than by grade.

Second, the lower medians in the first and second grades are probably due to the method of testing all children regularly in kindergarten, if possible. Some schools have a large percent of the floating type of population. These children, many of whom are of the dull or border-line type, often receive their initial testing in the first or second grade. There is pedagogical

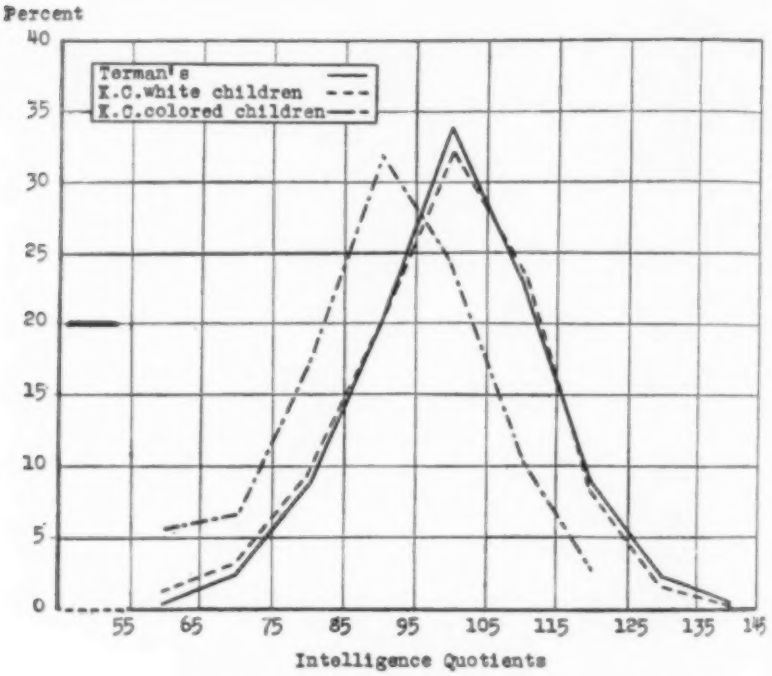

FIGURE 2. INTELLIGENCE QUOTIENTS FOR 6,063 WHITE PRIMARY CHILDREN, FOR 375 COLORED PRIMARY CHILDREN, AND FOR TERMAN'S 905 UNSELECTED WHITE CHILDREN

retardation also, in the first and second grades. Not enough third-grade tests have been given to show the situation in that grade. In case all children not tested in the kindergarten, first, or second grades, were tested in the third grade, the median intelligence quotient would probably be lower than in the other grades because of greater pedagogical retardation in this grade.

Third, it will be observed that the medians for the colored children are somewhat lower than those for the white children. Among the colored children, however, the same kind of difference is found as among the white children, namely, the kindergarten medians are higher than the grade medians. The reasons for these differences are probably the same as they are for the differences among the white children.

Fourth, the summary of results for foreign children may not be of considerable value, since it is very difficult to determine the exact influence of language handicaps.

Fifth, it will be observed in Figures 1 and 2 that the 1924-25 curve for white children more nearly conforms to the Terman curve than does the curve for the combined results of previous years. Doubtless Figure 2 more accurately represents the true situation. During the first years that the work was carried out, as outlined in this paper, it was not possible to cover the schools so completely as now because the work was begun with a small number of examiners. Figure 2, therefore, gives a more complete picture of the real situation than does Figure 1. The writer wishes to emphasize the fact that these curves are made from tabulated results that include the work of from twenty to twenty-five trained examiners.

THE EFFECT OF MENTAL-SET OR ATTITUDE ON THE READING PERFORMANCE OF HIGH-SCHOOL PUPILS

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The purpose of this study was to determine the effect of the pupil's attitude on comprehension in reading as measured by a standardized reading test. The initial assumption was that varying mental attitudes of more or less temporary nature may be induced in such a way as to affect the reading and interpretative processes of pupils.

Experiments in the field.—Although numerous investigations deal with the effect of incentives and attitudes on learning, the experiments do not completely agree, and no final conclusion can be deduced regarding the effect of incentives and attitudes on learning. An examination of the literature will, however, substantiate certain general statements. Setting up a definite aim seems to be relatively effective in learning. Feeling tone and mood are not so effective as they are thought to be. Encouragement and discouragement may have some effect, but individual differences and the nature of the learning are important factors in determining the influence of such procedures. In simple reactions pain is probably more effective, but in the higher types of learning encouragement is better.

Two investigations have bearing on the present study. Judd and Buswell[1] found that attitude in reading had a marked effect on the character of eye-movements. When subjects were told to read a paragraph once silently and rapidly just to find out what it was about, the results were quite different from those secured when the same subjects read the article again more carefully in order to answer questions on the content. The first type

[1] Judd, Charles H., and Buswell, Guy T. *Silent Reading: A Study of the Various Types.* Chicago, University of Chicago, 1922. pp. 28-54. (Supplementary Educational Monographs, No. 23)

was characterized by fewer fixations, shorter duration of fixation pauses, and especially fewer regressive movements. The same investigation points out striking differences in the character of the eye-movements among various special forms of reading when contrasted with ordinary silent reading. For instance, reading to paraphrase required nearly four times as many fixations a line as did any other type.

Peterson[2] reports an investigation of the effect of attitude on recall. When students read a list of words without the intention to recall, their performance in reproducing the words was much poorer than when they were told recall would be required. The determination to recall in order to reproduce the list of words seemed to bring about a form of intensive concentrated study which resulted in superior performance.

The Experiment

In order to determine the effect of varying mental attitudes on the reading performance of a single group, it was necessary to find selections of about equal difficulty, to use an objective method of scoring the reading performance, and to know the amount of time used by each pupil on each form of the reading material. No variable was involved except the given attitude which the experimenter had sought to create in the minds of the subjects. The Thorndike-McCall Reading Scale seemed to meet the requirements just enumerated. It has ten forms of equal difficulty which have been carefully standardized and can be objectively scored.

A freshman class in science at the Hyde Park High School, Chicago, was the group tested in this investigation. The class was judged by the teacher of about average ability and had completed half of the first year's work. During May and June, 1924, five forms of the Thorndike-McCall Reading Scale were given to this class.

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[2] Peterson, Joseph. "The Effect of Attitude on Immediate and Delayed Reproduction: A Class Experiment," *Journal of Educational Psychology*, 7:523-32, November, 1916.

Each of five forms of the Thorndike-McCall Reading Scale was administered under different conditions. Form III was given first in order to establish rapport and to become acquainted with the conditions governing the particular class. The standardized directions printed on the first page of the test were used on this occasion. Four varying sets of directions were used with the other four forms of the test in an effort to induce different mental-sets or attitudes. The directions were typed and pasted over the standardized directions on the first page of the appropriate test form. One form of the test was administered each week for five weeks. The four attitudes investigated will be called encouragement, skimming, discouragement, and reproduction; and they will be discussed in the order listed.

Encouragement.—Form IV of the test was given to encourage and stimulate the pupils as much as possible. It was thought that some knowledge of the average and extremes of the class on the preceding test would spur the group to equal or exceed the average of other ninth grades. The directions were:

> This test may look like one you have taken before, but you have never seen it. The test you took last week contained some hard questions, but you should not have so much trouble with these questions. Maybe you hurried through the other questions too fast, since the average score of the class was not so high as it should have been. Some of you scored as high as the twelfth-grade average, while others dropped as low as the sixth-grade average. The average score of the whole class was just about what it should be at the beginning of the eighth grade. See whether you cannot pull up the class average today and if possible beat the average of other ninth grades of the country. Do not hurry too much and, if you think it necessary, go back and make sure that you have made no mistakes. You will have enough time, but do not waste it. At a later date you will be told how well the class has done on this test. As soon as you are sure that you have done your best, quietly bring the blank to the teacher's desk and then return to your seat.
>
> How high did some go on the last test?.....
> How low did others fall on the last test?.....
> What was the average for the whole class? .....
> What should be the average score today? .....

Skimming.—On Form V of the test, an attempt was made to induce an attitude of skimming by the direction "Read the

questions first and then read rapidly through the paragraph for the answers to the questions." The pupils were told that it was possible to save time by such a method and that it might be unnecessary to read the whole paragraph, if the answers were found before finishing the reading. The directions were:

The scores on the last test were a little better than on the first one. However, the average score of the class is still below that of other ninth grades of the country. Today we shall try a different way of taking the test. Probably this new method will help you to save time and to make a better score. Instead of reading the paragraph first, skip it and look at the questions first. Then you may run your eye rapidly through the paragraph for the answers to the questions. It is likely that you can read more rapidly when you know exactly what questions are to be answered. In some cases it may not be necessary to read the whole paragraph, if the answers are all found before finishing the reading. Here is an example of the way you are to take this test. (Be sure to read the questions first.)

Nell's mother went to the store on Water Street to buy ten pounds of sugar, a dozen eggs, and a bag of salt. She paid a dollar in all. Nell and Joe went with her. On the way home on Pine Street, they saw a fire-engine with three horses.

Who paid for the sugar? .....
Where did Joe go? .....
Whose mother went shopping? .....

Last time some of the best papers were among the first to be turned in. Also some of the poorest scores were made by pupils who finished early. As soon as you are sure that you have done your best, quietly bring the blank to the teacher's desk and then return to your seat.

Discouragement.—Since the pupils had been encouraged and stimulated on an earlier form of the test, an attempt was made to discourage them on Form VII. This was done by pointing out the difficulty of the given form and by suggesting the possibility of certain "catch" questions in the test. Several sample "trick" questions were given in the directions, and the questions given at the close of the directions again called attention to the nature of the test. Form VII was chosen in preference to Form VI, for a great deal of the reading material in the latter had been covered in previous forms of the test. The directions were:

Last time the average score of the class was improved and came up to the ninth-grade average of other schools. After the test next

week all who wish to know their scores will be told how well they have done on the tests. The test today is a hard one. There are some difficult paragraphs which you have never read before. You are not expected to do so well as on the other tests, but of course you are to do the best you can. If you do not know some of the answers, the only thing you can do is to leave the spaces blank. Sometimes tests have certain trick questions. See whether you can find the "catch" in the following list of questions:

When did Balboa discover America? .....
Was Daniel Webster one of the good presidents of the United States?
.....
Was Longfellow a soldier or an inventor? .....

Keep your eyes open for such questions on this test, since it takes careful reading to see through a catch question. Do not look at anyone else's paper or talk to anyone about the questions. When you have finished, quietly bring the blank to the teacher's desk and then return to your seat.

What kind of questions are you likely to find on this test? .....
Is the test to be an easy one? .....
Are you expected to make a good score? .....

Reproduction.—Form VI was given with the direction to remember the answers for the purpose of reproduction on the following day. Some of the careless mistakes made on the previous test were quoted to show that care was necessary in selecting only correct answers for reproduction. Some of the questions included in the preceding test were repeated in the directions to impress upon the pupils the need for some effort in memorizing the answers. The directions for the reproduction test were:

This is the last test. Your teacher has the scores on the other tests and will tell you what they are at the end of the period. Since this is the last test, try to remember as many of the answers to the questions as you can. Your teacher will ask you for the answers tomorrow. It is easy to read a paragraph and to write down a few answers to questions, if it is not necessary to remember what is read. However, it takes more careful reading and some study when you know the teacher is going to ask for the answers the next day. Many of the mistakes which have been made on the other tests are due to careless reading. For example, some pupils thought the children at Oak Farm picked blackberries and hunted eggs in the brook. Others said that a wasp stung the roebuck and that he listened with one foot. Since you are

to give your teacher the answers on this test tomorrow, let us see how well you remember the questions you answered last week.

Did Nell's mother buy more than twenty eggs? .....
How many sisters had Beauty? .....
On what day did Bob sleep latest? .....
Did the arrow kill the roebuck? .....
Who or what chases the clouds? .....

When you have finished, quietly bring your blank to the teacher's desk and then return to your seat.

The Results

Table I presents the T-score averages of the class group on the five forms of the reading scale. The approximate school-grade equivalents of the T-scores and the average number of minutes spent on each form of the test are also included. The letter B following the grade number indicates the higher section of the grade.

TABLE I. TEST RESULTS WHEN THE SCORES OF ALL PUPILS PRESENT ARE INCLUDED

Test	T-Score Average	School-Grade Equivalent	Average Time in Minutes
(1)	(2)	(3)	(4)
Preliminary	58.4	VII–B	21.0
Encouragement	58.7	VII–B+	23.0
Skimming	60.8	VIII–B	18.2
Discouragement	58.0	VII–B–	18.3
Reproduction	62.0	IX–B	17.6

Since the attendance of the pupils varied somewhat on the days when the tests were administered, it is advisable in making comparisons to use the group which was present throughout the five forms of the test. Thirteen pupils were present for all forms, while thirty-one attended for one or more of the tests; in fact many of them missed only one form. Table II gives the results for the thirteen pupils who were present throughout the experiment. The interpretation of the results is based on the data of Table II.

Encouragement.—The relatively low score on this form does not indicate the improvement that might have been expected.

New material may have affected the score, even though all forms of the test are supposed to be of equal difficulty. The experiment indicates that pupils may do better work on a form containing paragraphs they have read before, even though different questions are asked. This statement might not hold true if the tests were scattered over a period of months rather than weeks. Perhaps the motive was not strong enough. It may not have been enough to tell how low and how high the extreme individuals of the class scored and what the class had to do in order to reach the average of other ninth grades of the country. It may

TABLE II. TEST RESULTS OF THE THIRTEEN PUPILS WHO WERE PRESENT FOR ALL FORMS OF THE TEST

Test	T-Score Average	School-Grade Equivalent	Average Time in Minutes
(1)	(2)	(3)	(4)
Preliminary	58.7	VII–B+	21.0
Encouragement	57.0	VII–A+	23.5
Skimming	60.1	VIII–A+	20.2
Discouragement	59.1	VIII–A−	20.0
Reproduction	61.5	IX–A	17.7

be that some nominal prize offered for the highest score would have secured better results. Possibly some specific method could have been given for improving the score on the test. A definite reading procedure is suggested in the next form of the test.

Skimming.—There is an increase of one year in the average score of the group when the results of the hasty reading are compared with the encouragement results. When pupils realized it was possible to read the questions first and skim through the paragraphs for the specific answers, the reading seemed to be guided by some definite purpose. The average time used was reduced by about three minutes. Whether such a form of reading should be adopted for general purposes is debatable, but on the basis of the limited number of pupils tested, the method seems to have some merit. There is some evidence on this form, as well as on others, that the rapid reader tends to make better

scores than the slow reader. Usually a few careless pupils finished first, while a few inferior pupils were the last to turn in their papers. The capable pupils as a rule finished in the earlier half of the time allowed.

Discouragement.—The pupils scored about one-half year below the average made on the preceding form of the test. Probably they were quite willing to believe that the test was difficult and did not try so hard as on certain other forms of the test. The principal factor, however, was the suggestion that there were trick questions in the test, for several of the group appeared suspicious of questions whose answers should have been quite obvious. Typical answers to such questions were: "It didn't say," "Nobody," or "None," whereas the answer was plainly stated in the body of the paragraph. Examples of these questions are: "Who or what chases the clouds?" "Did the roebuck listen with one foot?" "It says that there is a light upon the grave of the pine tree's dead. What makes it?" Probably children are more willing to believe that a test is difficult and contains catch questions than to believe a test is easy and simple.

Reproduction.—The group averaged more than a year higher on the reproduction test than on the discouragement test. Perhaps the increased practice and familiarity with the general procedure used in the tests reduced the amount of time necessary to complete this form. A tangible motive was introduced when the pupils knew the teacher would ask some questions about the test on the following day. Doubtless this fact made them more careful, for some of the obvious errors, made by certain members of the group in the first part of the tests, were eliminated.

Limitations of the Experiment

Since an attitude is a subjective quality, the experimenter cannot be certain that the desired attitude has been induced. Possibly the stimulus employed reacted on one pupil and not on another. As an effort was made to keep all factors constant with the exception of the attitude which the experimenter sought

to convey to the pupils, the results secured should prove fairly tangible. When the average of the group on a form of the test is materially different from preceding or subsequent performances, it is reasonable to attribute at least a part of this difference to the mental-set or attitude with which the pupils approached the reading.

It is possible that the pupils may have improved in performance with successive forms of the test. Although different questions are used in each form of the Thorndike-McCall Reading Scale, certain paragraphs are repeated, and a pupil is probably more or less familiar with the general sense of a paragraph which he has seen at some previous time. Growth of confidence in the administration of several forms of the same test may have enabled the pupils to make a gradual improvement in the successive forms of the test. The procedure used in the present investigation could be altered by giving the various forms of the test in the same order to a control group which has only the standardized directions accompanying the reading scale as a guide. In this way any improvement due to practice effect could be determined. If any increase in the scores of the control group were due to practice effect, such improvement would discount equally the scores made by the experimental group which had taken the several forms of the test with varying attitudes or directions

IMPROVING HANDWRITING THROUGH DIAGNOSIS AND REMEDIAL TREATMENT

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After an extended study of laboratory experimentation in handwriting, a diagnostic plan of analysis and remedial treatment was devised.[1] It was then thought best to give the plan an experimental application in practical schoolroom work for the purpose of (1) discovering its practicability, (2) establishing more detailed directions for its use in schoolrooms, and (3) finding its limitations with a view to its improvement for practical use.

The plan of diagnosis consisted, in outline, of a consideration of the following elements:

1. Rate in letters per minute
2. Quality on a handwriting scale
3. Habits in letter form, the two following defects being noted:
   a) No fixed image of the letter
   b) A definitely wrong image
4. Slant, in connection with which three defects were noted:
   a) Extreme
   b) Mixed
   c) Changing slant
5. Coordination, with special attention to type of stroke as:
   a) Wavering
   b) Angular
6. Motor control, whether
   a) Loose
   b) Restrained
   c) Mixed
7. Unit stroke, in which the writer may neglect to give each stroke full value
8. Spacing (wide, narrow, mixed) between
   a) Words
   b) Letters
9. Passage between words in which there is a waste of time, and very poor connection from the end of one word to the beginning of the next.

[1] Bulletins 1 and 2 of the Handwriting Series on Remedial Treatment, published by the Public School Publishing Company, 1926.

It was judged best that the plan should be put to experimental test in a school system far enough removed from the director of the experiment to insure that it would not be dominated by his own personal interference. All direction was carried on by correspondence.

Through the kindly cooperation of Mr. R. L. Wise, director of Educational Research in the schools of Kansas City, Kansas, certain of the typical schools of this city were chosen. The Supervisor of Penmanship Instruction, Mr. W. W. Thomas, gave his assent to the undertaking and withdrew the ordinary plan of supervision from the experimental rooms during the progress of the experiment. The experiment was carried on within the spring term of each of two successive years. In the first year the experiment was conducted with the fifth-grade classes of two schools, and the corresponding classes of two other schools were used as control groups. This experimentation was largely preliminary as an aid to the formulation of the plan. During the next year nine rooms cooperated, all from the sixth grade, five in the experimental group and four in the control group.

Samples of handwriting were secured from all the pupils in both the experimental and control schools by following standardized directions. The pupils wrote the Gettysburg Address for two minutes. Samples of the ordinary handwriting of pupils in other subjects were likewise collected. The samples secured were mailed to the experimenter. They were graded according to the Ayres Scale and were diagnosed in detail as quickly as possible.

The data for the control classes were laid aside, but those for the experimental classes provided the basis for a detailed set of recommendations. On the basis of a study of individual papers a diagnosis was made for each class and recorded on a chart. From these data a summary report was made for each room which included:

1. Comparison of the class average with the norm in both *rate* and *quality*, together with recommendations as to the need for improvement in these elements. For example, in case the rates were too fast and the quality poor, a slowing down of speed was recommended until quality sufficiently improved.

2. Notation of those pupils who were below or above the norms in rate and quality.
3. Notation of the defect in which class drill was specifically needed, in such a case nearly all of the class showed a need of improvement in this respect; and suggestions for conducting the needed drill were given.
4. A list of pupils who might be excused from class drill on this defect, with suggestions as to special drill in which they might profitably engage during this period.
5. A plan of classifying pupils, for drill purposes, into two or three groups, according to needs, with notation of those pupils who would need much attention and drill, and those who would need little.
6. Suggestions as to the transfer of pupils from each of these groups into new groups, as they might gain sufficient command of the particular element concerned, with lists of pupils who might probably be ready for transfer.
7. Informal discussion of the needs of the class and of the types of drill needed in effecting an improvement in the case of specific individuals, groups, and the class as a whole.

Within a period of two weeks from the time the initial test was made, the complete analyses were sent to the teachers concerned, together with a complete explanation of the plan of diagnosis, and its use in grouping for remedial work. These embraced material of a general character on the topic "Diagnosis as an Aid to Penmanship Instruction," and also blue prints of the samples of penmanship there given for illustration and for training. Large charts were blue-printed and placed in the hands of each teacher for the purpose of giving specific guidance to each group according to its need. These charts had upon them samples of handwriting, greatly enlarged, so that they might be seen plainly from the back of the room. Each one dealt with one of the characteristics of handwriting noted above.

After the remedial instruction had progressed for the specified time, another test was given to both the experimental and control groups which served as a final test. In the first year the initial tests were given on March 16 and the final tests on May 2, after a month of actual classroom work. In the following year, the final tests were unfortunately delayed to a time so near the end of the school year that the conditions incident to the close

of the school probably prevented the proper administration of the tests.

The final tests were analyzed in the same way as were the initial tests, with regard to each of the elements of diagnosis, and the papers were graded for both rate and quality. In order to insure absolute objectivity in grading, each paper was given a key number, and all of the papers for the initial and final tests, for the experimental and control groups were shuffled. In this mixed order they were graded without reference to school or date. Each paper was graded twice, and in case of a disagreement between first and second judgments, a third was decisive. A number of changes in pupil enrollment occurred between the initial and final tests, but only the records of those pupils who took both tests were preserved for tabulation and analysis.

The problem of chief concern has to do with the comparative improvement of the control and experimental groups during the period of training. Do the groups receiving the special diagnosis and training show improvement which may be attributed to the special training which they received? The summary data for the first year are given in Table I, in order to show a comparison of the four schools concerned, and to show the combined record of both control groups and both experimental groups. In this table as well as in Table II, the coefficient of reliability is the difference divided by the probable error of the difference. Table I shows that all groups were below the norm in quality (50) for the fifth grade, there being little difference between the control groups and experimental groups in this respect. In both cases there is an approximation to the norm of 64 in rate.

There was a general improvement in quality between the initial and final tests for three of these four schools, as judged by the score in quality. The experimental schools, however, made much more decided gains than the control schools. Indeed, one of the latter showed an actual loss of 2.7 points. These facts are made clear in Figure 1 where the trend of progress of the various groups is shown. The coefficients of reliability show that the gains made by the experimental schools are highly reliable, while

the one gain made by the control schools cannot properly be spoken of as a gain, apart from the result of chance factors. The loss made by the other control school is likewise of low reliability and so is not significant as a loss.

Doubtless the gain in quality of School A is accounted for in part by the loss of speed; but if this is so, it shows the value

TABLE I. A COMPARISON OF EXPERIMENTAL AND CONTROL GROUPS. FIRST EXPERIMENT, GRADE V

	Initial Test	Final Test	Gain	Coefficient of Reliability
(1)	(2)	(3)	(4)	(5)
	Experimental Groups			
School A (32 pupils)				
Rate	74.5	70.0	−4.5	
Quality	35.8	42.7	6.9	4.6
School B (31 pupils)				
Rate	50.5	64.7	14.2	
Quality	37.7	41.3	3.6	2.25
Combined Record				
Rate	62.7	67.4	4.7	
Quality	36.4	42.1	5.7	4.9
	Control Groups			
School C (34 pupils)				
Rate	64.2	67.4	2.6	
Quality	37.2	38.4	1.2	0.75
School D (24 pupils)				
Rate	61.5	83.0	21.5	
Quality	39.4	36.7	− 2.7	1.54
Combined Record				
Rate	63.1	73.9	10.8	
Quality	38.1	37.7	− 0.4	0.3

of the directions, since this teacher was advised to slow down the rate of writing to a figure nearer the norm. The remarkable gain of 6.9 points in one month of practice cannot, however, be entirely explained by this fact. It is noteworthy that School B is successful, not only in bringing its speed up to the norm, but also making progress in quality.

The gain made by the control group of School C in both rate and quality probably represents a fairly normal rate of improvement. The gain made by School D in rate was entirely unwarranted by actual needs, revealing an instructional emphasis dur-

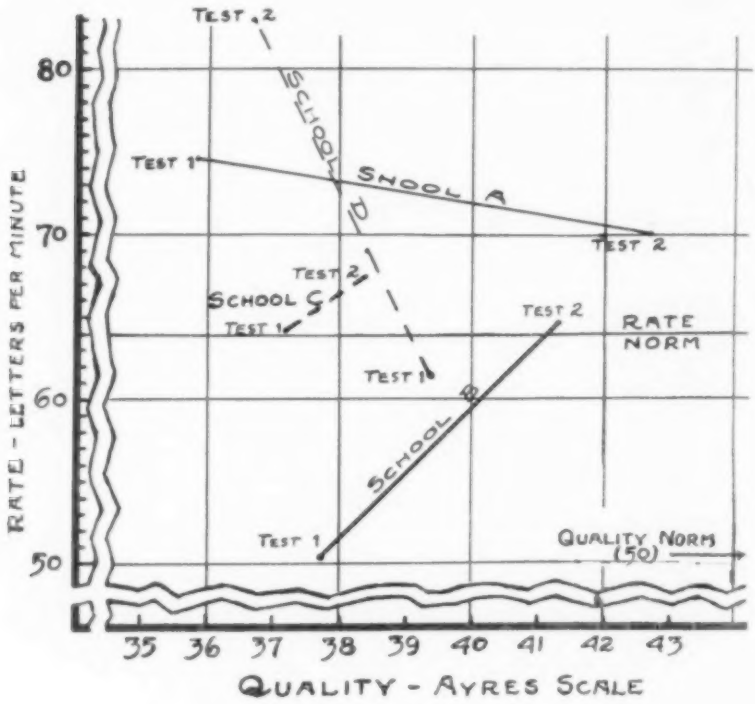

FIGURE 1. GAINS OF EXPERIMENTAL AND CONTROL SCHOOLS IN RATE AND QUALITY. FIRST EXPERIMENT, GRADE V

ing the period which was probably the cause of retrogression in the quality record.

The combined record of the two experimental classes shows that they made an average gain of 5.7 points in quality with a high coefficient of reliability (4.9), and that at the same time they increased the rate of writing appreciably. The control classes, on the other hand, though gaining in rate more than the

experimental classes, made an average loss of 0.4 points — not significant in itself.

Table II gives the essential facts concerning the second experiment. Considering the fact that the period of practice in the second experiment was fully twice that of the first, the gains made by the experimental groups were not remarkable. Only one of these groups, however, failed to make a reasonably reliable improvement in quality. The reason for the lack of improvement in this one case is not known to the experimenter. In two cases, Schools B and G, the teachers were advised to guide the pupils to a slower rate for a time until the quality improved.

When all experimental group results as shown in Table II were combined, the total of 132 pupils were found to have held their own in speed and to have made a gain of 6.2 points in quality. The significance of this gain may be appreciated by noting that a proportionate gain for an entire school year would result in an improvement of over 15 points on the Ayres Scale. Three of the classes, all much below the norm, were brought up to the norm for the fifth grade. In this connection it is interesting to note the progress of Schools A and B, which were included in the experimental groups of both years, the sixth grade of the second being composed largely of the same pupils as the fifth grade of the preceding year. These made gains from 35.8 to 51.3 and from 37.7 to 50.3 respectively during the two periods of actual training, probably about four and one-half months. The comparatively small gains of these schools during the period from June to February of 2. and 1.6 points respectively where the schools were not carrying on the special training has significant bearing on the values of the method, even if one takes into consideration the loss incident to an intervening summer vacation.

A consideration of the control schools in Table II reveals the fact that only one of these made an improvement in quality which may be regarded as reasonably reliable (School J; coefficient of reliability, 3.17). The marked loss of one of the classes in rate of writing, together with a slight loss in quality, is striking as an illustration of what may occur in the ordinary

plan of class instruction, where there are no definite objectives, or where these may be wrongly emphasized. The averages of

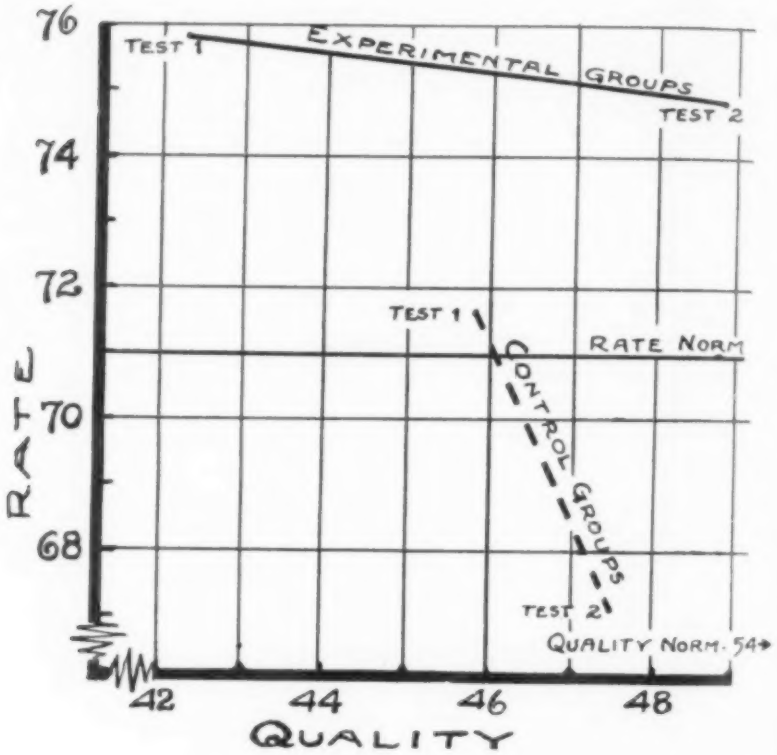

FIGURE 2. COMPARISON OF PROGRESS OF ALL EXPERIMENTAL SCHOOLS AND ALL CONTROL SCHOOLS. SECOND EXPERIMENT, GRADE VI

the combined control groups as given in Table II show a slight loss in rate of writing and a comparatively small gain in quality with low reliability. The comparisons are clearly brought out in Figure 2.

The writing samples in Figure 3 are two typical cases of improvement among members of the experimental group through

TABLE II. A COMPARISON OF EXPERIMENTAL AND CONTROL GROUPS. SECOND EXPERIMENT, GRADE VI

	Initial Test	Final Test	Gain	Coefficient of Reliability
(1)	(2)	(3)	(4)	(5)
	Experimental Groups			
School E (19 pupils)				
Rate	67.8	71.3	3.5	
Quality	39.7	41.6	1.9	0.65
School A (36 pupils)				
Rate	72.9	77.2	4.3	
Quality	44.7	51.3	6.6	3.3
School F (29 pupils)				
Rate	72.0	74.6	2.6	
Quality	44.3	52.2	7.9	3.76
School B (29 pupils)				
Rate	79.3	70.4	− 8.9	
Quality	42.9	50.3	7.4	3.43
School G (19 pupils)				
Rate	88.4	81.1	− 7.3	
Quality	38.4	43.9	5.5	2.43
Combined Record				
Rate	75.8	74.8	− 1.0	
Quality	42.6	48.8	6.2	6.22
	Control Groups			
School H (31 pupils)				
Rate	60.1	64.1	4.0	
Quality	48.5	50.6	2.1	1.48
School I (17 pupils)				
Rate	62.9	66.4	3.5	
Quality	44.4	46.8	2.4	0.96
School J (20 pupils)				
Rate	74.8	74.9	0.1	
Quality	43.5	50.0	6.5	3.17
School K (40 pupils)				
Rate	82.7	65.9	−16.8	
Quality	45.4	44.2	− 1.2	0.47
Combined Record				
Rate	71.6	67.1	− 4.5	
Quality	45.8	47.5	1.7	1.76

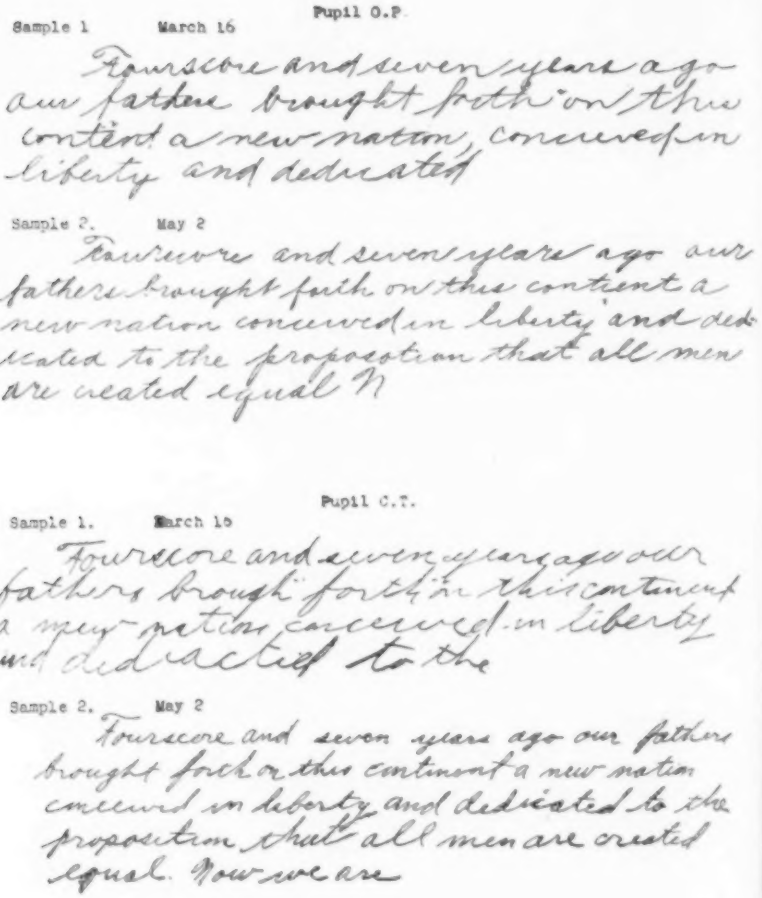
Pupil O.P.
Sample 1 March 16
Fourscore and seven years ago
our fathers brought forth on this
content a new nation, conceived in
liberty and dedicated
Sample 2. May 2
Fourscore and seven years ago our
fathers brought forth on this content a
new nation conceived in liberty and ded-
icated to the proposition that all men
are created equal N
Pupil C.T.
Sample 1. March 19
Fourscore and seven years ago our
fathers brought forth in this continent
a new nation, conceived in liberty
and dedicated to the
Sample 2. May 2
Fourscore and seven years ago our fathers
brought forth on this continent a new nation
conceived in liberty and dedicated to the
proposition that all men are created
equal. Now we are

FIGURE 3. TYPICAL CASES OF IMPROVEMENT IN HANDWRITING FOLLOWING ONE MONTH OF REMEDIAL DRILL. GRADE V

a month of remedial drill. These samples were written by fifth-grade children in connection with the first experiment. There was a marked decrease in the actual number of serious defects of all types in the experimental group.

Conclusion and Discussion

The plan of diagnosis proposed has been found justified by experimental evidence. Pupils of grades v and vi have been found to make much more rapid progress when the plan was used than under ordinary procedure. Not only was there extraordinary improvement in rate and quality for nearly all of the experimental groups concerned, but there was a corresponding change for the better in specific characteristics in which drill was advised. Individuals of these classes evidenced marked improvements in quality due to the fact that certain defects had been made the occasion for intensive, motivated drill.

Considering that these favorable results were secured under conditions that were far from favorable, they become even more highly significant. The director of the experiment was far removed from the scene of action, and both he and the teachers who were engaged in the experiment were too busy to keep in touch with each other by correspondence. No one actually directed the work of the teachers, either in helping them to make class diagnoses or to devise remedial work. The supervisor of penmanship and the director of research gave help only incidentally in testing. Under normal conditions there would be, and should be, someone capable of giving direction and advice, who would be available for consultation on short notice. Teachers would be helped to productivity by conferences and by the friendly suggestions of a supervisor. If, therefore, this plan was found to be successful under relatively unfavorable conditions, it should prove itself doubly so when operated systematically by an organized body of instructors.

This comparative isolation of the instructors concerned proves that the individual teacher may adopt the plan successfully in any school, with no more assistance than that supplied by the bulletins to which reference has already been made. The fact that the plan may be followed with any system of penmanship, makes it especially valuable. The local standards may be

sustained and local emphases continued while the plan is being followed.

The teachers in charge of the experimental classes described in this report expressed themselves in most cases as well pleased with the possibilities of the plan. Some noted the fact that they did not have time to master it properly; but they felt much interested in it, and believed that they profited greatly by the instruction received.

The new enthusiasm which comes to any teacher who undertakes individual work is in itself a sufficient justification for the adoption of such a plan. The growing number of schools that are emphasizing individual instruction prophesies the acceptance of plans such as this in relation to handwriting instruction.

THE COMMONEST SYLLABLES

A STATISTICAL INVESTIGATION IN THE FIELD OF READING BY THE WINNETKA TEACHERS' SEMINAR

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What are the commonest syllables in the English language? Or more exactly, what are the commonest syllables in the ten thousand commonest words of the English language?

To answer this, an analysis of Thorndike's word list was undertaken by the Winnetka Teachers' Seminar about two years ago. It grew out of the general problem of diagnosing and remedying reading difficulties under classroom conditions—a problem on which the seminar has worked since completing the determination of the persons, places, and events to which most frequent allusion is made and a problem on which it will continue to work for several years. One aspect of the big problem of remedial reading in public-school classes is that of determining children's ability in phonic analysis and training them in such analysis. The whole question of phonics as a means to independent reading needs further study. How far is it worth while, for what types of children, at what point may it most effectively be taught, and by what method—none of these fundamental questions have been answered scientifically.

It is generally assumed, however, that just as instant recognition of common words is an aid to fluent reading, an equally prompt recognition of certain frequently recurring letter-groups would be a help. The first- and second-grade teachers of Winnetka made the first statistical study of the frequency of such letter-groups, or phonograms, in primers and first and second readers.[1] In that investigation, phonograms were arbitrarily

[1]Vogel, Mabel, Jaycox, Emma, and Washburne, Carleton W., "A Basic List of Phonics for Grades I and II," *Elementary School Journal*, 23:436-43, February, 1923.

defined as letter-groups beginning with a vowel. It was explicitly recognized that they might equally logically have been defined as letter-groups beginning with a consonant; and as a matter of fact consonant combinations (without vowels) like *th*, *br*, and *fl* were also studied. The study, however, was avowedly limited to one general type of phonogram and to the vocabularies of first- and second-grade material.

In attacking the more general problem of ability to recognize common letter-groups throughout the grades, it was necessary to use a general vocabulary; hence Thorndike's list of the ten thousand commonest words in the English language was analyzed.[2] It was also deemed advisable to find a less limited and arbitrary criterion for determining the phonograms, or letter-groups, than that used in the investigation of primary reading material. After considerable discussion we decided to use syllables as our phonetic unit—syllables being defined as the parts into which a word is divided by Webster's dictionary. Two syllables spelled alike but differently pronounced (as indicated by Webster) are considered as different syllables.

The method of the investigation was as follows: Each of the ten thousand words in the Thorndike list was divided into its component syllables. Each syllable was copied on a small card. Diacritical marks were used when necessary to indicate the sound the syllable had in the particular word from which it was taken.[3] Whether the syllable came at the beginning, middle, or end of the word, was indicated, but no use has so far been made of this information. The index number assigned by Thorndike

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[2] Thorndike, Edward L. *The Teacher's Word Book.* New York Bureau of Publications, Teachers College, Columbia University, 1921. 134 pp.

[3] An occasional error crept in here; the members of the seminar sometimes failed to put the diacritical marks on vowels that might have more than one sound. It would have been better had we copied the entire word on each card, in addition to the syllable. Shades of sound difference have been ignored—no distinction, for instance, is made between the *a* in *ask* and the *a* in *ash*. For practical purposes of word recognition such differences are probably of no importance.

TABLE I. THE TWO HUNDRED COMMONEST SYLLABLES ARRANGED ACCORDING TO THE NUMBER OF DIFFERENT WORDS IN WHICH EACH SYLLABLE WAS FOUND[a]

Syllable	Number of Different Words in Which Found	Sum of Indexes of Words in Which Found	Syllable	Number of Different Words in Which Found	Sum of Indexes of Words in Which Found
(1)	(2)	(3)	(4)	(5)	(6)
ẽr	589	9,276	ăs	53	534
tion	295	3,262	prō	52	750
ā	295	2,982	ĕl	52	536
ĭn	253	3,109	ăd	50	584
rē	208	2,925	sion	50	490
ī	195	2,036	ŏn	49	1,006
ę̄	174	3,268	prē	48	522
ĕn	170	1,627	dĭ	47	665
cŏn	159	2,093	nā	45	578
ŭn	154	1,443	ă	45	387
ăl	153	2,078	pă	43	651
ĭ	150	1,443	sō	42	554
blę	147	1,833	ĭsh	42	491
ō	143	1,625	dĭ	42	405
dē	133	1,965	ăc	41	732
ē	117	1,530	ăr	41	646
lȳ	103	1,538	căl	41	370
mĕnt	102	1,178	tĭve	41	309
ĕx	102	917	rā	41	301
dĭs	101	1,241	tō	39	1,105
rȳ	100	1,540	ăp	38	656
ăn	95	725	păr	38	498
ous	88	911	pō	38	421
ful	84	1,081	tĭc	38	310
tĭ	84	852	ĕd	38	230
rĭ	82	938	sȯn	36	639
cŏm	80	1,306	tĕn	36	520
dĕ	79	1,704	sĭ	36	439
pĕr	78	1,070	çĭ	36	373
măn	75	1,192	ĕt	36	347
bē	73	1,922	prē	35	416
vĕr	72	793	ătę	35	416
dăr	71	1,146	sē	35	394
lĕss	69	653	çȳ	35	356
ū	68	883	ā	34	399
tā	65	636	ĭc	34	247
ôr	64	1,171	lā	33	385
ĭm	63	667	lĭ	33	293
ĭng	59	1,210	nĭ	33	249
tôr	57	543	bār	32	574

TABLE I.—(*Continued*)

Syllable	Number of Different Words in Which Found	Sum of Indexes of Words in Which Found	Syllable	Number of Different Words in Which Found	Sum of Indexes of Words in Which Found
(1)	(2)	(3)	(4)	(5)	(6)
lănd	32	362	ū	24	313
lē	32	291	căn	24	285
mō	32	284	mā	24	281
cū	32	271	ănt	24	276
ĕm	32	259	wāy	23	473
wĭth	31	2,841	ş	23	434
mŏn	31	469	wȧrd	23	348
ĕs	31	347	căr	23	308
tŏn	31	347	lāte	23	294
ănce	31	314	cā	23	271
sā	31	295	ĕv	22	635
fĕr	30	556	pĕn	22	426
ĭs	30	508	ăm	22	273
mĭs	30	359	sŭr	22	230
fş	30	264	sū	22	172
nō	29	596	mē	21	308
tăl	29	341	ion	21	304
mā	29	286	lĕt	21	276
lŏw	28	745	ŏb	21	262
mēr	28	736	mĭn	21	177
ŏut	28	555	mī	21	123
āge	28	457	fôre	20	392
tūre	28	419	glė	20	271
ĕ	28	139	ā	20	251
ăt	27	642	sĕn	20	250
plė	27	459	sūre	20	132
dlė	27	454	pā	19	387
ĕnt	27	433	lār	19	292
dĕn	27	424	ŏp	19	288
fôr	26	474	trī	19	256
gēr	26	462	shĭp	19	246
măr	26	445	mĕn	19	213
vĕn	26	359	găr	19	191
vĭ	26	306	trăns	19	141
vā	26	278	dāy	18	643
sŭb	26	272	some	18	586
lt	25	666	ĕrn	18	460
tain	25	564	clė	18	268
ŭp	25	552	rĕc	18	261
cō	25	229	ĕnce	18	236

TABLE I.—(*Continued*)

Syllable	Number of Different Words in Which Found	Sum of Indexes of Words in Which Found	Syllable	Number of Different Words in Which Found	Sum of Indexes of Words in Which Found
(1)	(2)	(3)	(4)	(5)	(6)
ăb	18	178	môr	16	256
lĭn	18	177	hăr	16	231
lū	18	114	sĭn	16	222
grā	18	75	băr	16	222
ôf	17	648	sẽr	16	216
fā	17	384	fĭ	16	209
gĕn	17	346	cẽs	16	191
prĕs	17	283	lō	16	162
whĕre	17	223	dā	16	156
tĭn	17	216	sẏ	16	114
lĭ	17	190	sīde	15	337
tŭr	17	187	gō	15	284
pē	17	185	house	15	275
ĭl	17	174	pôr	15	238
tū	17	166	tẽm	15	226
dō	17	130	pôrt	15	210
rōw	16	399	cẽr	15	206
dẏ	16	316	côr	15	184
bĭ	16	280	tăr	15	117
fôr	16	262	ŭm	15	113

*There are undoubtedly errors here and there in this list. Where a teacher was reasonably sure of the division of a word into syllables, the dictionary was not referred to, yet the teacher may have been wrong. The failure to record the word from which a syllable was taken, on the card with the syllable, resulted in our not being able to check on doubtful pronunciations. For practical purposes, however, the list is substantially correct and usable.

to the word from which the syllables were taken was also copied on the card. Figure 1 is a sample card. Altogether we made about thirty thousand such cards.

The results were tabulated in three ways: first, the syllables were arranged in order according to the number of different words in which they occurred; second, they were rearranged in order according to the sum of the index numbers of the words in which they were found; and third, they were arranged alphabetically, each syllable being followed by the number of words in which it occurred and the sum of the index numbers of these words.

For practical classroom purposes, it is unlikely that more than two hundred syllables will be used. Moreover, from the stand-

point of deciphering new words, a child probably has more use for a syllable which occurs in many reasonably common words than for one which occurs in fewer, but very common words—this for the reason that the latter tend to become sight words. Accordingly, Table I is offered, embodying the top two hundred words according to the first arrangement described above.

As to the arrangement of syllables according to the sum of the indexes of the words in which they occur, there is, as might

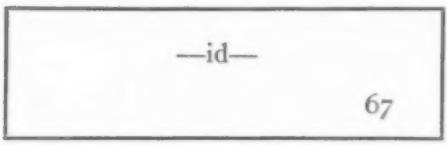

FIGURE 1. A SAMPLE CARD

be expected, much overlapping upon the content of Table I. The top two hundred words according to this arrangement consist of 156 words already shown in Table I, together with 44 words which do not appear in that table. These 44 words with the frequency data for each of them are given in Table II.

As to the best use of these syllables, we are still in the dark. The commonest of those beginning with a vowel agree fairly well with our earlier study of phonograms common to readers used in the primary grades. Are not syllables, perhaps, more reasonably sound units or letter groups than arbitrarily formed phonograms? Anyway, would it not help some children in learning how to work out new words independently, if they had skill in instant recognition of common syllables? Winnetka has no answer as yet to these questions. It is hoped, however, that the publication of these common syllables will result in experimentation concerning the value of syllables as phonograms and concerning the general value of training children in phonic analysis. If ability to recognize common syllables is an important factor in reading, tests can be devised to measure this ability and practice exercises prepared for its development.

TABLE II. THE FOURTY-FOUR SYLLABLES AMONG THE TOP TWO HUNDRED, ACCORDING TO WORD INDEXES, WHICH DO NOT OCCUR IN TABLE I

Syllable	Sum of Indexes of Words in Which Found	Number of Different Words in Which Found	Syllable	Sum of Indexes of Words in Which Found	Number of Different Words in Which Found
(1)	(2)	(3)	(4)	(5)	(6)
thēr	425	11	would	281	2
mȳ	408	12	tĕnd	278	10
lông	391	10	hĭm	275	3
thing	380	6	pärt	274	9
bȳ	365	13	hear	274	5
four	361	6	sĕt	272	12
cōl	361	13	ĕst	272	10
gōōd	349	13	mōst	269	8
thēre	347	10	gree	267	8
ūre	342	14	văl	266	13
tīme	338	10	găn	265	11
tūre	333	11	one	263	4
cōme	332	7	plāy	259	13
hėr	320	14	hē	257	4
hĭs	319	7	head	255	13
oth	311	3	take	255	6
būt	310	6	sŭn	253	14
light	309	13	here	253	7
thē	300	9	ăf	252	13
when	300	4			
whăt	292	5			
hŏw	288	8			
new	287	13			
sĕlf	286	10			
līfe	283	10			

AN EXPERIMENT WITH STANDARDIZED TESTS IN A STATE TEACHERS' EXAMINATION

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During the summer of 1925, Robert Clark of the Teacher-Training Division of the State Department of Education, West Virginia, in consultation with the writer, decided to include standard tests in the uniform state teachers' examination. Examinations in orthography, reading, penmanship, arithmetic, English grammar, physiology and hygiene, civil government, United States history, geography, theory and art of teaching, and agriculture are given annually to teachers. As an experiment we decided to use the Pressey Diagnostic Test in English Composition, the Pressey-Richards Test in American History, the Buckingham-Stevenson Test in United States Geography, and the Stevenson-Ridgley-Shipman Tests in European Geography in lieu of the traditional examinations in grammar, American history, and geography. Examinations in the usual form were given in the other eight subjects.

TESTS FOR TEACHERS' EXAMINATIONS

Handling the material.—We hesitated at first to ask fifty-five county superintendents of varying degrees of training, to administer these new and complicated tests. It is not easy to become sufficiently familiar with the directions of the tests to be able to administer them while the distribution of the test materials needed to supply an entire county is a task in itself.

Throughout the state, two thousand teachers took the examination. In order to supply every county superintendent with sufficient material, we ordered thirty-five hundred copies of each of the various tests. The superintendents submitted rather rough estimates of the number of probable candidates, but by adding a few extra copies to each apportionment the central office disbursed the material so successfully that in only one of the fifty-

five counties was there a shortage. Mr. Clark sent a sample copy of each test and the directions for giving and scoring the test, with the following letter, to each superintendent:

In the uniform examination on May 14-15, *standard tests* will be given in history, English, and geography instead of the usual written examinations. These tests will take their regular place on the examination schedule but will not require the full amount of time allowed in the printed schedule.

It is not necessary to become confused with these tests. This suggestion should be passed on to the applicants. These tests are quite as simple as the usual kind of examinations. Sample copies of the tests, with the printed instructions, are inclosed herewith. Examine them carefully. Practice them until you understand them thoroughly.

Follow the exact time-schedule given in the Examination Handbook except in the three subjects in which the standard tests are given. The time schedule for the standard tests is as follows:

English — (4 pamphlets)
- Capitalization . . . . . 5 minutes
- Punctuation . . . . . 10 minutes
- Grammar . . . . . 15 minutes
- Sentence structure . . . . . 12 minutes

History — (1 pamphlet)
- Test I . . . . . 5 minutes
- Test II-III . . . . . 6 minutes each
- Test IV . . . . . 8 minutes

Geography — (2 pamphlets)
- (a) United States
  - Part I . . . . . 8 minutes
  - Part II . . . . . 6 minutes
- (b) Europe
  - Part I . . . . . 8 minutes
  - Part II . . . . . 6 minutes

Failure to follow each direction as printed will cause confusion and make the results valueless. *The time* must be observed exactly. A mistake of a few seconds may ruin the results. Usually give the signal at five seconds before the minute to "get ready," then exactly on the "60" say "go," keep the time carefully, and allow the exact number of minutes.

Note:

There will be no manuscripts in these three subjects. Each applicant will mark the test pamphlet or blank given him and return it to the examiner.

These tests will then be sealed in the manuscript envelope in the usual way.

In the same envelope you must enclose all *unused* test blanks. This is important.

Be certain to have the applicant write his name and address on each test blank before he begins the test. Age, race, etc., are not required.

Please make the examination report and send all manuscripts to us by express as quickly as possible after the examination. Such action will be a great help to us.

Reaction of county superintendents.—Soon after these letters were sent out, Mr. Clark was beset with letters and telephone calls. Some of the messages expressed the firm conviction that an effort to administer standard tests would result in confusion and in many cases in utter failure. Others were less emphatic but expressed unmistakable anxiety in the outcome. Still others at the beginning seemed pleased with the innovation and were confident that it would prove superior to the traditional type of teachers' examination.

Reaction of teachers.—The writer gave the tests to teachers of Kanawha County. When the new form of examination in English was described to them, many of the teachers were markedly uneasy. Many seemed much bewildered, and some were almost indignant. A few were pleased at the thought of being rated by a standardized objective instrument. When the English tests were ended, the writer asked the teachers to express their reactions freely; it was at once apparent that hostile attitudes had changed. The majority of the teachers preferred tests to the older examinations. Quite a number asked where the tests could be obtained and how to use them with the pupils.

Upon returning the material to the central office, almost all of the superintendents who commented, said that the teachers generally were enthusiastic over the standard tests. A few expressions from county superintendents follow:

"I like the standard tests better than any examinations I have ever seen. The applicants prefer them to the old 'standby' questions."

"The teachers liked the standard tests used during the May examination. Not a single objection or criticism was offered by the applicants. I do not know just how successful they were in this test, but I feel that it is a step forward."

"Standard tests are very satisfactory. They come much nearer testing general knowledge than regular examination. Give us more of them the next time."

The superintendents evidently had found that it was by no means so difficult to conduct the examinations as they had thought.

Scoring the results.—When the grading board of eleven members met at Charleston, three of the members scored the standardized tests. Close records were kept of the time required to grade each of the examinations, and, contrary to our predicted hopes, almost the same amount of time was required to score the standard tests as to grade the average traditional examination. Mr. Clark thinks that those grading the new tests worked with unusual caution—in fact, they found it difficult to hurry.

Some Studies of the Results

Before recording the grades on the standardized tests, it was necessary to transmute them to a percentage basis because the perfect point-score in English is 112, while in history it is 100, and in geography, 150. Our method of making these transmutations may not have been the one which the authors of the various tests would have recommended, for this reason the writer suggests that the authors of standardized tests work out a table to accompany their tests by which the point-score can readily be transmuted into a percentage rate. This will be especially desirable if these tests are to be used in teachers' examinations where some of the records are reported on the basis of 100 percent. In the absence of such a table, we computed units of transmutation that place the average grade in the standardized tests about on a par with the average grade in the other examinations.

From the records put in this comparable form, we have attempted a few studies, most of which are based upon the records of one hundred teachers selected as typical of the entire state. One of the most illuminating bits of evidence furnished by these tests is a comparison of the scores of applicants with the national norms for the various grades. The reader is cau-

tioned against drawing any conclusions regarding qualifications of teachers in West Virginia from the following comparisons. The percent of applicants achieving the various standards in English composition were:

STANDARD	PERCENT
Below seventh grade	19
Seventh grade	13
Eighth grade	14
Ninth grade	24
Tenth grade	6
Eleventh grade	9
Twelfth grade	1
College Freshman or above	14

It must be remembered that these applicants merely applied for the certificate to teach and compared in almost no way with the majority of teachers who have been licensed to teach through their attendance at normal schools, colleges, and universities.

Perhaps the outstanding features of the summary just given are the percent of the candidates who make less than the seventh-grade standards and the percent who make scores as good or better than college Freshmen. Exactly fifty percent of the group we are studying as typical failed to secure any grade of certificate. This seems to place the minimum standard in English equivalent to the standard for the ninth grade. In fact, the medians approximated the ninth grade in the three standard tests. The percent of applicants achieving the various standards in United States history were:

STANDARD	PERCENT
Below seventh grade	4
Seventh grade	12
Eighth to eleventh grade	61
Twelfth grade and above	23

In interpreting and comparing these percents with those in English, we are at once annoyed by the lack of uniform methods in reporting the scores. The absence of standards for grades VIII, IX, X, and XI makes a complete comparison impossible. A comparatively large percent of applicants made scores equivalent to the twelfth-grade norm or above. The determination of the

geography scores have not been completed. In general there is apparent uniformity in the distributions of scores in the three standard tests. In so far as comparisons are possible, they are consistent. Another marked contribution of the standard tests, especially in English and history, is their revelation of the points of strength and weakness in the knowledge of the applicants. The diagnostic character of the tests shows that despite the current criticisms of poor knowledge of grammar, the applicants made higher scores in grammar than in capitalization or punctuation. We are confident that a further study of results will reveal other unexpected evidence.

TABLE I. CORRELATION BETWEEN VARIOUS SUBJECTS

Subjects Correlated	r	P. E.
Standardized Test		
Grammar and geography	.68	± .06
Grammar and history	.65	± .06
History and geography	.56	± .07
Average for standardized tests	.63	
Traditional Examinations		
Reading and arithmetic	.56	± .06
Reading and civics	.49	± .08
Reading and theory and art of teaching	.76	± .08
Theory and art of teaching and civics	.51	± .09
Arithmetic and theory and art of teaching	.24	± .09
Average for traditional examination	.50	

The consistency of scores in the various subjects was investigated by the use of Pearson's Product-Moment Method of Correlation. The records of forty typical candidates were used and are summarized in Table I. The correlations run much higher for the standard tests than for the traditional examinations; in fact, a correlation of 0.63 is evidence of considerable consistency. These studies of distributions and correlations check so completely with predictions that our hopes for a successful experiment seem realized. The tests have furnished other objective evidence, such as pointing out good and bad markers, but space does not permit an alignment of this sort of evidence.

Summary

The chief contribution of the experiment was the proof of the practicability of using standard tests in teachers' examinations. Their value may be summarized as follows:

1. Tests permit an objective rating of teachers, which in turn will permit wide-spread comparisons.
2. They introduce teachers in a concrete way to the movement of educational tests and measurements.
3. They permit a ready method of analyzing and diagnosing an individual's specific and general weaknesses in various subjects.

If authors of standard tests will lend assistance to some centralized direction in the matter of establishing methods of reducing point-scores to percents, or of establishing norms for certain grades of certificates, state and county superintendents can make general use of these objective instruments of educational measurements.

A MODIFIED FORM OF THE TRUE-FALSE TEST

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Ever since McCall[1] first formally introduced the true-false test, many articles in educational magazines, as well as chapters in pedagogical books, have been devoted to this popular "new-type" test. Moreover, a careful examination of the complete bibliography of such testing, prepared by Brinkley,[2] reveals that most of the contributions bearing upon the true-false test either describe the test, analyze its merits and shortcomings, or discuss the statistical considerations relative to the guessing factor as it affects the scoring. To date few attempts to modify the form of the true-false test so as to eliminate objections which are generally recognized as inherent in its present form have been recorded; but expressions of a desire for its improvement are not infrequently found. Barthelmess, for example, points out the weakness of the true-false "as an instrument for diagnosing special individual difficulties," and says further, "if a test could be devised which would have all the advantages of the true-false and correct for this disadvantage, it would be heartily welcomed."[3]

A few modifications of the test, however, have been suggested. Knight requires his students to mark the test questions "T," "F," and "U" (undecided) and gives them time only to read each statement and make an instantaneous decision. An advantage of this modification, he thinks, is that it "discourages the proclivity to borrow from one's neighbors."[4] Farwell gives

[1] McCall, W. A. "A New Kind of School Examination," *Journal of Educational Research*, 1:33-46, January, 1920.

[2] Brinkley, Sterling G. *Values of New-Type Examinations in High School.* New York, Teachers College, Columbia University, 1924. 121 pp. (Teachers College, Columbia University, Contributions to Education, No. 161)

[3] Barthelmess, H. M. "Reply to a Criticism of Tests Requiring Alternative Response," *Journal of Educational Research*, 6:357-59, November, 1922.

[4] Knight, F. B. "Data on the True-false Test as a Device for College Examination," *Journal of Educational Psychology*, 13:75-80, February, 1922.

this direction to his students in physics: "If a statement is correct, put the sign plus before the number; if the statement is wrong, rewrite it in positive form just below." He later states an objection to this feature when he says, "It is still partly of the essay type, and too often the correct statement is merely the paraphrase of the one given, with the proper manipulation of words to make it true. All in all, little seems to be gained by the added requirement of rewriting."[5]

In his examination in educational psychology Miller includes statements of three kinds: "true; false; those that may be either true or false, depending upon conditions not expressed in the statements." The students are here required to mark the questions respectively 1, 2, or 3. Among the advantages which the author thinks this third possible answer gives to the true-false test are the following: (1) it covers a wider range of knowledge and so involves a greater number of important points; (2) it helps free the examination from insignificant facts since it is often difficult, if restricted to the true and false, to find and express clearly a large number of significant statements; (3) it reduces the element of chance from one-half to one-third; (4) the results probably correlate more highly with the averages of various other tests than do results of the old-form true-false test, though the author states that this fact has not yet been determined.[6] The purpose of this investigation is to determine some of the relative merits of a modified form of the true-false test as compared with the conventional true-false.

Method

The subjects for this investigation were a number of university Seniors studying educational measurements, and groups of pupils from junior and senior high-school classes enrolled as

[5] Farwell, H. W. "The New-Type Examinations in Physics," *School and Society*, 19:315-22, March 15, 1924.

[6] Miller, George F. "A Variation in the True-false Achievement Test," *School and Society*, 20:250-51, August 23, 1924.

follows: one class in tenth-grade biology,[7] one each in ninth- and seventh-grade general science, and two in eighth-grade general science. For the university class, a test of forty-two items was prepared, and for each of the other classes one of fifty items. Each set was then divided into two halves, each half containing the same number of true statements, but having about twice as many false as true statements. The items in the respective halves were paired as accurately as could be done subjectively with respect to type and difficulty. For each class the entire set of statements was mimeographed as Sheet I and an exact duplicate of the items on Sheet I was mimeographed as Sheet II with the exception that the items in the second half of I became those of the first half of II. Thus, numbers one to twenty-five on Sheet I became numbers twenty-six to fifty on Sheet II, and vice versa. Both Sheets I and II were distributed to members of each class during the same class period.

The directions upon Sheet I were as follows:

Some of the following statements are true, and some are false. Put a letter "T" in the left margin opposite the statements you consider to be true as stated, and an "F" opposite those you consider false. Do not fail to mark all of the statements. In all cases when in doubt, guess

Examples: 1. *T* Carbon dioxide is more dense than air.
2. *F* Carbon dioxide is more dense than water.

The directions upon Sheet II were:

Some of the following statements are true and some are false. Put a letter "T" in the left margin opposite the statements you consider to be true as stated, and correct the statements you consider to be false by *substituting* an appropriate word or phrase for some word or phrase in the original statement so as to make it true. Make all changes in the form of *substitutions*. No credit will be given for false statements which are corrected merely by the insertion of the word "Not."

Examples: 1. *T* Carbon dioxide is more dense than air.
2. Carbon dioxide is less dense than water.

Some typical items and responses, selected for illustration from the various Sheets I, follow:

6. *F* The first product scale was worked out by Courtis in English composition.

[7] The authors wish to make grateful acknowledgment of the help of Miss Esther Friedrich of the University High School Department of Science, in preparing and marking the test in biology.

38. *F* Practice tests in such a subject as arithmetic are used primarily for diagnostic purposes.

1. *T* An eclipse of the moon occurs only at full moon.

7. *F* An inflated tire weighs less than it would if it were not inflated.

Correct responses to these same items on the corresponding Sheets II follow: [8]

28. The first product scale was worked out by Thorndike in handwriting.

16. Practice tests in such a subject as arithmetic are used primarily for drill purposes.

26. *T* An eclipse of the moon occurs only at full moon.

32. An inflated tire weighs more than it would if it were not inflated, or, (since this statement can be made correct by substitutions in two different ways).

32. A deflated tire weighs less than it would if it were not deflated.

It will be noted that the sole difference in the two test sheets is that Sheet I requires the pupil only to decide whether the statements are true or false, and then to mark them "T" or "F" as the case may be; whereas with Sheet II he must not only decide whether the same statements are true or false, but he must analyze the false ones to detect what the erroneous element or elements in them are, and then must substitute for the incorrect words or phrases, others which correct all the inaccuracies in the original statements.

In marking the tests, it was found that somewhat more time is required by the examiner to score the modified form than for the true-false, though after a few papers have been scored, the extra time required for the modified form is little. With respect to statements which admit of more than one correct answer, it is easily practicable to make a key which indicates the acceptable alternatives. Occasionally as in the completion form of test, though less frequently in this modified form of the true-false,

[8] The numbers of identical items do not correspond, of course, because the order of the two halves was reversed on Sheet II.

an admissible answer is given which did not occur to the examiner in making the test; but these cases are relatively rare, and their noting does not require much additional time; nor do such sporadic cases appreciably affect the objectivity of the test. Furthermore, it takes no longer to construct items for the modified form than it does to make good statements for the conventional true-false; in fact, if one may judge from the nature of the corrections required, the modified form is probably apt to contain fewer inconsequential items than the old form of true-false. Moreover, one soon acquires the knack of constructing suitable test items for the modified form.

It may appear, on first thought, that the pupils themselves will not be able to score the modified form, but practice shows that they can score it satisfactorily. Slightly more time is required in scoring the modified form than is needed by them in correcting the true-false, but this added expenditure of time is amply justified through the added discussion occasioned by the effort to determine the proper answers. Further discussion gives the modified form a teaching value superior to that of the true-false.

Results

Table I shows that the modified form takes more time to administer than the true-false. In the seventh grade the fastest pupil finished the true-false in six minutes and forty seconds, while it took the fastest pupil fourteen minutes and fifteen seconds to complete the modified form; the median pupil finished the true-false in eleven minutes and fifteen seconds, while the median pupil required twenty minutes to complete the modified form; the last pupil to finish the true-false required fifteen minutes and fifteen seconds, while the last pupil to complete the modified form required twenty-seven minutes and forty seconds. Similar results were obtained from all six classes. For the five classes in science, the average difference in median time was 38.2 percent, and the difference between the medians for the university students was 16.5 percent.

The modified form is more difficult for the pupils than the conventional true-false. The range in scores for the eighth grade in the true-false—scored as right and wrong—was 27 to 48, while in the modified form it was 13 to 43. For the tenth grade the mean in the true-false was 40.46 and in the modified form was 35.94. Proportional reductions resulted in each class.

The modified form possesses a greater usefulness in homogeneous grouping for drill upon certain units of work than does the true-false. This fact is shown in Table II by the consistently greater standard deviations of the modified form: with the true-false, the standard deviation for the seventh grade was

TABLE I. TIME IN MINUTES AND SECONDS REQUIRED BY EACH PUPIL IN EACH CLASS TO FINISH EACH FORM OF TEST

Groups	True-False Test			Modified Form		
	First Pupil (Min.-Sec.)	Median Pupil (Min.-Sec.)	Last Pupil (Min.-Sec.)	First Pupil (Min.-Sec.)	Median Pupil (Min.-Sec.)	Last Pupil (Min.-Sec.)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
VII.....	6–40	11–15	15–15	14–15	20–0	27–40
$VIII_1$...	8–45	15–12	22–0	12–0	18–30	28–40
$VIII_2$...	9–55	13–45	18–30	9–50	19–45	22–45
IX.....	8–15	15–50	20–30	13–0	19–40	24–50
X.....	10–15	13–15	20–30	12–43	17–50	23–15
In university	12–0	18–10	24–15	14–0	21–10	30–0

4.16, while with the modified form it was 4.76; for the eighth grade the standard deviations were respectively 4.70 and 6.36 with a corresponding reduction in the case of each class.

An examination of the test papers, moreover, reveals the great superiority of the modified form over the conventional true-false for diagnosis of individual and class difficulties and weaknesses. For example, occasionally a pupil changes a statement which is already correct in such a way that it is still correct, though with altered meaning; such a reaction is therefore welcomed as being indicative of confusion about that particular point

in the pupil's mind, and as revealing a teaching opportunity which the older form could not bring to light.

The modified form seems a better power test than the true-false. The superiority of the modified form over the true-false is shown by the relative ranges, means, and standard deviations given in Table II, together with the data in Table III. While the five best pupils in the tenth grade made a mean score of only

TABLE II. COMPARISON OF THE RANGES, MEANS, AND DEVIATIONS OF SCORES FROM TESTS OF THE TRUE-FALSE AND THE MODIFIED FORM

	Groups					
	Grade VII	Grade $VIII_1$	Grade $VIII_2$	Grade IX	Grade X	In University
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Number in class	22	28	24	26	15	53
Range in score						
True–false	28–46	27–48	27–43	27–47	31–48	26–40
Modified form	27–44	13–43	22–41	24–46	24–46	24–40
Mean scores						
True–false	37.1	33.8	35.5	38.3	40.5	34.2
Modified form	35.0	30.4	31.5	37.2	35.9	33.1
P. E. of mean scores						
True–false	±.58	±.60	±.60	±.71	±.94	±.15
Modified form	±.68	±.81	±.82	±.84	±1.02	±.15
S. D. of mean scores						
True–false	4.16	4.70	4.38	5.38	5.38	1.65
Modified form	4.76	6.36	5.98	6.36	5.78	1.63

two points lower on the modified form than on the true-false, the five poorest scored a difference in average of 6.8 points, and all the rest of the class scored an average difference of 4.0 points. Except that the middle group in the ninth grade scored nearly the same average in both tests as also did the five best pupils, there was, in both tests, a consistently greater difference for all six groups between the mean scores of the weaker members of the classes than those of the stronger pupils.

A study of individual scores reveals, moreover, the fact that a number of the more able pupils actually scored several points higher in the modified form than in the old form, because, as

TABLE III. COMPARISON OF THE AVERAGE SCORES IN THE TRUE-FALSE TEST AND THE MODIFIED FORM OF VARIOUS GROUPS OF PUPILS SELECTED ON THE BASIS OF TEACHERS' JUDGMENTS WITHOUT REGARD TO TEST SCORES

Groups	Scores of Five Best Pupils	Scores of Middle Group	Scores of Five Poorest Pupils
(1)	(2)	(3)	(4)
Grade VII			
True–false	42.8	38.3	34.8
Modified form	40.2	34.2	30.0
Average difference	2.6	4.1	4.8
Grade $VIII_1$			
True–false	37.8	32.4	30.2
Modified form	33.8	27.9	23.0
Average difference	4.0	4.5	7.2
Grade $VIII_2$			
True–false	38.4	34.7	31.0
Modified form	37.2	30.9	26.0
Average difference	1.2	3.8	5.0
Grade IX			
True–false	45.4	37.6	31.4
Modified form	44.6	37.3	26.6
Average difference	.8	.3	4.8
Grade X			
True–false	42.2	40.8	36.4
Modified form	40.2	36.8	29.6
Average difference	2.0	4.0	6.8
In University			
True–false	37.3	34.4	28.6
Modified form	36.3	32.4	25.2
Average difference	1.0	2.0	3.4

several stated, under the necessity for more careful analysis and reasoning in the former, they discovered meanings overlooked when taking the true-false. On the other hand, the weaker pupils, almost without exception, scored higher in the true-false

The modified form as tested is more reliable than the true-false. This can be verified by referring to Table IV. Only in the case of the tenth grade was the reliability of the true-false higher than that of the modified form; here these reliabilities were respectively .74 and .69. The fact that the modified form showed a consistently higher reliability for the tests in science than for that in educational measurements may indicate that possibly this form of test is better adapted to the work in science

TABLE IV. COMPARISON OF THE RELIABILITY COEFFICIENTS OF THE TWO HALVES* RESPECTIVELY OF THE TRUE-FALSE TEST AND THE MODIFIED FORM COMPUTED BY THE PEARSON PRODUCT MOMENT FORMULA

	Group					
	Grade VII	Grade $VIII_1$	Grade $VIII_2$	Grade IX	Grade X	In University
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Number in class	22	28	24	26	15	53
Reliability r, True-false	.59	.62	.13	.57	.74	.21
Reliability r, Modified form	.74	.82	.78	.75	.69	.34

*Twenty-five items each for the tests in science, and twenty-one items each for the tests in measurements.

than to that in the other course. The relatively small number of cases and classes used in this investigation, especially in the latter subject, however, prevents definite conclusions upon this point.

Table V reveals that the reliability of the modified form compares favorably, in so far as these tests in science may be indicative, with the reliability of the recall and the multiple-response tests experimented upon by Ruch.[8] The reliabilities of Ruch's

[8] Ruch, Giles M. *The Improvement of the Written Examination.* New York, Scott, Foresman and Company, 1925. p. 111.

recall and five-response tests were respectively .90 and .89, while that of the modified form (science) was .93. The reliability of these true-false tests in science, furthermore, is comparable with those of the true-false and the two-response tests reported by Ruch. The reliability of Ruch's true-false was .71; of his two-response, .85; and of these (science) true-false, .82.

TABLE V. COMPARISON OF THE RELIABILITIES OF ONE HUNDRED ITEMS OF SEVERAL TYPES OF TEST REPORTED BY RUCH, WITH THE RELIABILITIES OF ONE HUNDRED ITEMS OF THE AUTHORS' TRUE-FALSE TEST AND MODIFIED FORM, COMPUTED BY BROWN'S FORMULA[a]

Type and Test	Number of Pupils	Reliability r, Half versus Half[b]	Reliability r, 100 Items
(1)	(2)	(3)	(4)
Ruch's			
Recall	562	.81 ± .010	.90
Five-response	137	.80 ± .021	.89
Three-response	134	.60 ± .037	.75
Two-response	135	.74 ± .027	.85
True-false	133	.56 ± .040	.71
Authors'			
True-false (science)	115	.53 ± .045	.82
Modified form (science)	115	.76 ± .026	.93
True-false (measurements)	53	.21 ± .089	.54
Modified form (measurements)	53	.34 ± .082	.69

[a] $r = \frac{nr}{1 + (n-1)\ r}$ (Ruch, *op. cit.*, p. 99)

[b] Fifty items each for Ruch's tests, twenty-five items each for the authors' tests in science, and twenty-one each for the authors' tests in measurements.

The stronger pupils, while being unanimous in pronouncing the modified form more difficult than the old form, like it better. Discussions with individual pupils reveal the fact that they enjoy the challenge of the puzzle element and the stimulus to wholesome competition offered by the modified form, which, they think, gives them a "better chance" to reveal what they "really know." Pupils come, moreover, to approach the modified form with a different attitude from that which they showed toward the old form. A study of the individual papers illustrates this fact by more than one instance where a pupil wrote opposite a

question, "I don't know," and ignored the chance of answering correctly by marking the item "T." Furthermore, the pupils accustomed to taking this modified form of true-false soon develop, more or less, as indicated by the statement previously referred to, the habit of critical scrutiny and analysis and of weighing every word. This is a desirable habit, which is probably not fostered to a greater degree by any other form of test. This modified form, since it demands a focusing of attention upon content, eliminates whatever tendency there may be on the part of the more alert pupils to concentrate upon the mere mechanics and technique of wording of the statements.

The modified form tends to eliminate any elements of chance that may lurk in the true-false. While it may not be proved objectively by the evidence presented in the preceding tables, it is obvious that lucky guessing is scarcely possible in a statement demanding the changing of one or more words or phrases, though its probability is indicated by the smaller mean scores and wider ranges of the modified form shown in Table II. The plausibility of this statement is revealed, moreover, by an examination of individual performances in both tests; one of the weakest pupils in the eighth grade, for example, scored 36 on the true-false test, 2.2 points above the mean for the class, but with identically the same items in the modified form she scored only 13, or 16.48 points below the mean.

While Ruch[9] states that "pure guessing (in the true-false) is comparatively rare with most individuals," some guessing, nevertheless, is generally admitted as a probability with the true-false test. It is true, of course, as McCall[10] suggests, that the old form may invite a high type of analytical reasoning upon every statement, yet one cannot tell whether the correct answer to any given statement is the result of clever analysis or of lucky guessing. However, this element of guessing, be it small or large, can be practically, if not entirely, eliminated by the use of this modified form of the true-false, in which the items are

[9] Ruch, *op. cit.*, pp. 116-17.
[10] McCall, *op. cit.*, pp. 44-46.

such that all require changing, and by informing the pupils at the beginning of the test that such changes are necessary.

Summary

From this investigation it seems reasonable to conclude that this modified form of the true-false test is more difficult than the conventional true-false. It is inferior in that it requires more time to administer and correct than the old form; but it is superior to the true-false in the following respects: (1) It is to a much greater extent a power test. (2) It possesses greater value for diagnosis of individual and class difficulties. (3) It gives a better basis for homogeneous grouping over subject-matter units. (4) It is more reliable since, in so far as elementary science is concerned, it has a reliability comparable with the best of the other "new-type" tests. (5) It is more popular with the abler pupils because of their belief in its superior merits. (6) To all intents and purposes it eliminates the element of chance.

Editorials

THE DOCTRINE OF ERROR

The greatest challenge in education is the errors which pupils make. Most of the measures adopted by teachers have reference to the prevention or removal of error. Do we not decide that one method of teaching is better than another because it leads more surely to the truth? Do we not select textbooks, devise tests, concoct drills—yea, and even discuss the aim of education—that we may diminish the force of the grim dictum, "To err is human?"

Not only does the error motif run through all our teaching; it is one of the bases of curriculum construction. When all the most frequent words have been listed, when all the prevailing allusions in magazines have been assembled, when the arithmetic of everyday life has been identified, when, in short, all the items it is needful to know have been brought together—we still have much to do before we have a curriculum. We must, among other things, apply the criterion of difficulty. And what is difficulty but the quality in virtue of which people make mistakes? Not all words need to be taught in school; reading and writing will take care of them. Many historical and geographical references are part of our environment outside of school; no formal teaching is required. The round of everyday affairs, the common experiences of life, are "extra-curricular." People do not make mistakes in doing them, unless it be by inadvertency or by a fault in the physical mechanism; and these are scarcely school problems. Thus the doctrine of error is of high significance in relation to the curriculum.

The same idea may be illustrated in job-analysis. Nothing is much more misleading than job-analysis carried no further

than the listing of activities. We hear about job-analyzing the superintendency and the principalship. The list of "things to do" in each case will be very long. As a basis for formulating a course of training, however, only the difficult activities need be considered—the ones in which principals or superintendents err. The principal sharpens a pencil; he does so very often. But we aren't going to include pencil-sharpening in our curriculum for training principals. Only those things need to be thrown into high relief which prove to be troublesome through the prevalence of error.

As the teacher becomes more and more experienced, the influence of error is apparent in many ways. For example, error leads to tolerance. If you know that $8 + 8 = 18$ is a type error —one that a certain percent of children will almost inevitably make—you will not think, as the inexperienced teacher often does, that this mistake when it occurs is a special example of infantile perversity. Thorndike analyzed errors in reading into types. The experienced teacher recognizes these types. He may not be able to classify them psychologically as Thorndike did, but he has met them often enough and has had, let us hope, enough learning capacity not to become emotional when they occur.

This is one of the blessings of experience. The teacher who has taught five years has met a host of errors. If he has not thereby become tolerant, less "jumpy," less inclined to believe a child who makes a mistake is personally insulting, then he has not the requisite experiencing nature. What the normal schools are trying to do, what every sincere writer of a professional book for teachers is trying to do, is to organize, systematize and interpret the experience of teachers to the end that for each new teacher the apprenticeship period may be abridged. The effort is by the analysis of error to save error.

The teacher after all must be the real analyst. He must catalogue—actually or figuratively—not only the common errors which pupils make in his field but also his own errors as a teacher. It is only as he does this that he will continue to grow. Stu-

dents of education have asserted that the value of teaching experience diminishes rapidly after a teacher has had five to ten years of it. We hear teachers claiming consideration for themselves on the basis of twenty-five or thirty or even forty years of service. So far as this is a claim for greater expertness than the same teacher had after ten years of service, the claim is likely to be unfounded. Yet not always. A few teachers grow as long as they serve, or until senility sets in. They do so by studying themselves and their job. And when the true nature of this study is revealed, it is found to be based on the *things that went wrong.* They were the errors of pupils that challenged remedy. Or they were the mistakes of the teacher himself from which he learned the lessons of "trial and error." Or finally, they may have been the things that went wrong for other people—things which the teacher in question experienced only vicariously—things which he learned in conversation and from books. At any rate the dynamic urge to growth in teaching lies in the challenging nature of error and the will on the part of the teacher to overcome failure.

B. R. B.

Reviews and Abstracts

PETERSON, JOSEPH. *Early Conceptions and Tests of Intelligence.* Yonkers-on-Hudson, World Book Company, 1925. 320 pp.

The best the reviewer can say to anyone who is interested in this subject is, "Buy the book and read it, you will not be sorry." True to its title, the book gives the early conceptions both of intelligence and of tests of intelligence. It is, however, excellently well balanced. The reader does not have to wade through long chapters of ancient philosophy before he gets to the problem in which he is most interested. At the same time he gets in brief but salient passages the evolution of present-day conceptions. For example, about a page is devoted to the early Greek views of "*nous.*"

Many a reader who knows only of Binet will be surprised to find that mental tests and tests of intelligence date back to Francis Galton. The problem of origins is always difficult, and the origin of the idea of mental testing is no exception. The world first heard of it through the work of Binet and Simon; but, as usual, when an historian gets at the problem, he finds the beginnings of these ideas farther back. It is, however, the historian's fallacy, knowing the idea as it is perfected in its final flowering, to see the same idea in the minds of earlier men who really did not see it themselves. It is proper enough in such cases to give the later man the credit for having gotten his idea from the work of the earlier, but it is not right to give the earlier man credit for the later man's idea when he never saw it. In this case, the author makes it pretty clear that Galton had a fairly definite idea of determining the intelligence of a person by means of certain tests of his intelligence. It is equally clear, however, that with Galton it was quite largely an academic matter.

In the first chapter, the reader is introduced to Binet and four chapters are devoted to Binet's preparation for the work and the historical background of the test. In the ninth chapter is found Binet's first intelligence scale. The remainder of the book comprises a very careful and highly interesting delineation of Binet's studies on the measurement of intelligence.

The author in his Preface apologizes for devoting so much attention to Binet. The apology is unnecessary. Whatever others have done, Binet will always remain the father of mental measuring. It was he who saw the problem in all its length and breadth, and it was he who practically solved it. His work and conception will ever be the foundation upon which all work in the measurement of intelligence must be grounded. No student can become a master of the problem without thoroughly knowing his Binet. As an introduction, giving one a general understanding of the whole movement, the present book is indispensable. Fortunately, too, it is so written that it is intensely

interesting from start to finish. It may well serve as a textbook in many normal schools and colleges, and will prove equally useful to the layman who wants to know what this mental testing is all about.

Ohio State University H. H. GODDARD

LEWIS, EUGENE ERVIN. *Personnel Problems of the Teaching Staff*. New York, Century Company, 1925. 460 pp.

Superintendent Lewis has written a readable book which will be welcomed by administrators who are beginning to realize that, even though budgets and buildings have most frequently been studied and written up in educational literature, the less tangible but even more important human-relation problems are the ones most difficult of satisfactory solution. "Business and industry are learning that the conservation of human capacity, human interest, and human energy is far more important than the conservation of other natural resources." "The development of a technique of personnel administration and supervision in business and industry has given rise to a considerable literature. A recent bibliography on the subject contains nearly two hundred titles." On the other hand, an examination of educational literature indicates that but meager attention has been given to personnel management in education.

Guided by a sane and wholesome philosophy of life and by accepted principles of school administration, the author has considered more than a score of the most frequently occurring administrative personnel problems, on each one of which he has given the reader a clear, concise treatment. Especially good features of the book are its wholesome atmosphere, sane philosophy of education, and common-sense treatment of everyday problems. The following quotations are samples selected almost at random: "Personnel work, if it is real, must be personal work." "Its ideal function is to increase human happiness." "Personnel work includes anything and everything that may add to the happiness and efficiency of workers." At the close of each chapter the author includes many pertinent problems for further investigation and discussion, together with carefully selected references for additional reading.

Ohio University GEORGE E. CARROTHERS

KNIGHT, F. B., RUCH, G. M., and STUDEBAKER, J. W. *Arithmetic Work-Book, Grade V*. Chicago, Scott Foresman and Company, 1925. 76 pp.

This unusual booklet is:

A series of thirty-seven standardized drill exercises on the essentials of fifth-grade arithmetic, together with study units on the persistent difficulties, and provision for extra practice on these difficulties. This Work-Book provides drill and problem work to supplement the classroom use of any good arithmetic textbook with fifth-grade pupils of average ability. Special provision is made for individual differences.

This text is unique because it is both self-teaching and self-directing. The pupil is told specifically what to do at every step, and why he should do it. In the study exercise preceding each drill exercise, the child learns from samples and reviews the technique to be employed by the drills which follow. Moreover, he is made familiar with the best principles of study. For example,

he reads, "Make it a rule from the first never to let a wrong answer go uncorrected. Never start to work without knowing exactly what you are to do" (p. 2). A few pages further on a number of specific good habits in arithmetic are listed for the pupil to employ in the next drill; later he learns how the standards for the drills were obtained.

"Hard spots" in addition, in subtraction, in multiplication, and in long division are presented with elaborate samples. An ingenious set of self-teaching exercises that suggests possibilities of self-teaching in other fields are listed as "Study Notes."

In like manner, from exercise to exercise, from page to page, one finds, in this rare piece of workmanship in text-writing and text-making, the kind of self-directed study which convinces the learner he *can* do things for himself, which makes him his own teacher, and which directs him in high-grade learning habits. These study notes take the place of the usual hit-and-miss blackboard presentation. They substitute teaching materials which have been arrived at by rigorous, scientific procedure. The pupil, becoming his own teacher and own tester, finds the learning job his own and assumes the responsibility. He proceeds to outdo his former record and has no occasion, as in the traditional recitation, to attempt to out-maneuver the teacher.

Teachers of fifth-grade arithmetic, and most specifically children of the fifth grade, will welcome this contribution to more effective teaching and learning; teachers of education will recognize their best theories and many of their scientifically derived principles put into practice; and supervisors and curriculum-makers will accept this *Arithmetic Work-Book* as a sample of the kind of thing they strive hard to develop in every field of school learning.

GARRY C. MYERS
Cleveland School of Education

BOOK, WILLIAM F. *Learning to Typewrite.* New York, Gregg Publishing Company, 1925. 463 pp.

The book gives a good summary of the conventional theories of learning and makes many definite and concrete applications of them to the learning of typewriting. It comprises three parts. In Part I the author discusses what animals and people do and the types of response which they learn to make. A number of diagrams show the physiology of conditioned stimuli and the like, while several illustrate the formation of specific habits of reacting to copy with a typewriter.

Part II applies these principles to the process of learning typewriting. The following main items are the result of such application: (1) getting the copy, (2) transcribing copy on the machine, (3) learning how to handle and manipulate the machine, and (4) acquiring finger dexterity and correct technique. From this point, the discussion is replete with practical suggestions.

The fact that letter, word, or phrase habits are experimentally found to arise together is used to indicate the desirability of practicing them simultaneously. Technical drills are recommended, if not carried to the extreme, inasmuch as they help in forming manipulation habits, in fixing difficult combinations, and in avoiding the over-learning of easy combinations. Normal

tendencies to error are analyzed and classified in a comprehensive topical fashion. The most frequent errors made by expert typists are discussed in detail. The causes of errors are found to be the wrong location of keys, improper control over letter-making movements, and mistaken reading of the copy. The discussion of special difficulties accounts for the typical features of the learning curve in terms of slumps of attention or effort, persistence of old successful methods, the greater difficulty in originating and fixing higher order habits, the daily relearning and warming up. Part III presents the rôle of the teacher and shows how the foregoing principles may be utilized.

The table of contents with an exhaustive topical outline greatly facilitates the appreciation of the details presented in the text. The first portion is profitable reading for those interested in advanced theories of learning. The other chapters are full of suggestions for one engaged in teaching or learning typewriting. The volume is well worth the reading of anybody who is interested in acquiring this particular type of habit.

Ohio State University HAROLD E. BURTT

KELLY, FREDERICK J. *The American Arts College.* New York, Macmillan Company, 1925. 198 pp.

One can readily agree with President Capen who, in the Introduction to this little volume, ***The American Arts College,*** says:

Oddly enough, we know very little about the college, in spite of the fact that it is so much discussed. The resources of the new scientific procedures of educational inquiry have seldom been applied to it. Research in college problems has been almost wholly lacking.

What is reported in it are the results of an investigation fostered financially by the Commonwealth Fund. The methods of inquiry were visits, conferences, and questionnaire forms returned by students, graduates, and college officers. The aspects of the college problem to which these methods were applied are its aims, courses and curricula, educational guidance, methods of teaching, measuring achievements, and student extra-curricular life.

In the chapter on aims Dean Kelly arrives at a working formulation of purposes which, if heeded, would assist materially in clearing the air of much confusing cant and verbiage and hasten the attainment of a functioning college. It is worth noting that the formulation gives place, during the last two years of the four-year unit, to the vocational motive. The reader will find other accommodations of the formulation to the trend of reorganization in higher education as this has been disclosing itself. The content of the chapter on courses and curricula, as is to be expected, is in harmony with the formulation of aims. The materials on guidance are suggestive of wide possibilities of expansion.

After a brief general statement, the chapter on methods of teaching includes a consideration of "general types of class procedure" and a section on the "recognition of individual differences, especially in the interest of superior students." The materials on measuring achievement include marking systems, methods of defining marks, scheme of credit for quality, honor points, and the like. Among the most valuable features of the book is the frequent

recourse to descriptions of innovations in practice, descriptions which put the reader in touch with the best of recent efforts to effect improvement within the college. Another is the many suggestions for "needed research" which, besides pointing out the lines of further inquiry, are an admission that we are far from knowing all we should know about the college.

The report should be read by presidents, deans, boards of trustees, alumni groups, and faculties, and all others who guide the destinies of the liberal-arts college. It is too much to hope that such a general acquaintance with it can ever be attained, especially as members of college faculties are concerned with subject-matter rather than being institutionally or educationally conscious. Despite this handicap of a lack of general interest in college problems on the part of those who should be interested in them, the book will be genuinely helpful, by affording guidance to the real leaders of improvement and reorganization. It will assist in breaking down the confidence in single panacean concepts, which is still characteristic of the philosophy of collegiate education, while those responsible for other units of the educational system have become increasingly conscious of the complexity of their problem.

L. V. Koos

University of Minnesota

RIDGLEY, DOUGLAS C. *Geographic Principles.* Boston, Houghton Mifflin Company, 1925. 190 pp. (Riverside Educational Monographs)

If an important element of a book is the background, then *Geographic Principles, Their Application to the Elementary School* by Dr. Douglas C. Ridgley, of the Graduate School of Geography at Clark University, should have an adequate one, for the author, Mr. Ridgley, is perhaps the best-qualified man in the country to write on geography methodology in the elementary schools.

This book is perhaps the first to present methods in the teaching of geography inclusively. Certainly it is the most practical. Too many books purporting to be concerned with geographic methods are, in the final analysis, but books on methods of teaching in general. Here are condensed, terse, but complete instructions in the principles of geography and in the presentation of geographic facts to the young student. Having investigated courses of geography in elementary schools and having found the course most commonly pursued, Dr. Ridgley makes each step in this average curriculum the subject of a chapter. He includes a definite outline of study and discusses it in detail. Since it sensibly conforms with what exists, the book will be of great practical value to many schools.

On the other hand, although definite working outlines are given, the teacher is urged "that variation of method of presentation is necessary to avoid stagnation." The course of study, the author says, should be the teacher's servant, not his master; it should serve merely as a guide and in no way limit the teacher's initiative. Above all it should be an inspiration—a goal that teachers too often forget. One cannot subscribe too strongly to this idea, especially when one approves generally of Mr. Ridgley's entire presentation.

RODERICK PEATTIE

Ohio State University

COOPER, RICHARD WATSON, AND COOPER, HERMANN. *The One-Teacher School in Delaware: A Study of Education.* Newark, Delaware, University of Delaware Press, 1925. 434 pp.

For many years school teachers have recorded records of attendance and school officials have collected them in a more or less desultory way. With the increased emphasis on compulsory attendance these records and reports have become more accurate. However, we have seen nowhere before the account of as thorough a study of the school-attendance problem as that made for the state of Delaware in this volume. The material covers a three-year period placing special emphasis on the data secured during the third year. The data are also analyzed in terms of the different geographic and economic sections of the state and the racial differences in school population. The classification of pupils, their progress, promotion and attendance, the attendance variations, and the factors in non-attendance, each make up a chapter, which is most informing because of the careful analysis made of the data secured. One who reads the volume feels that a definite problem was attacked, the best scientific procedure was utilized, and the results were presented in an illuminating way. The data should be the basis for constructive administration and positive development in Delaware education at least to the extent that the question of attendance is a potent factor in these one-room schools.

Ohio State University E. J. ASHBAUGH

BURT, CYRIL. *The Young Delinquent.* New York, D. Appleton and Company, 1925. 619 pp.

This book gives a comprehensive treatment of the problems of juvenile delinquency, a well-balanced combination of scientific data based on ten years experience, conservative statements of findings, and practical suggestions for dealing with the problems. It is an outstanding contribution in this field and should be recommended to parents, judges and probation officers in juvenile courts, social workers, and teachers, as well as to psychologists, psychiatrists, and sociologists. The use of case material and references to recent literature on this subject recommend it as a textbook for college or university work.

The author makes use of a statistical method of analysis. In each of his tabulations he places his findings for the delinquent group side by side with those for a non-delinquent control group drawn from the same area and of similar economic and social status. His conclusions are stated conservatively and with fewer than the usual sweeping generalizations. Neither heredity nor any single environmental factor is emphasized to the exclusion of others, though analyses of major and minor factors are made. "On the average," he tells us, "each delinquent child is the product of nine or ten subversive circumstances, one as a rule preponderating, and all conspiring to draw him into crime." No single panacea is offered, though in the details of case study and treatment as well as in the discussions of method much practical advice is given.

Ohio State University FRANCIS N. MAXFIELD

Publications Received, July 15 to August 15

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Fairbanks, H. W. *Home geography.* Boston, Educational Pub. Co., 1926. 276 pp. $.88.

Fenton, Norman. *Self-direction and adjustment.* Yonkers-on-Hudson, N. Y., World Bk. Co., 1926. 121 pp. $1.40.

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Polk, R. W. *The practice of printing.* Peoria, Ill., Manual Arts Press, 1926. 296 pp. $1.80.

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News Items and Communications

This department will contain news items regarding research workers and their activities. It will also serve as a clearing house for more formal communications on similar topics, preferably of not more than five hundred words. These communications will be printed over the signatures of the authors. Address all correspondence concerning this department to Doctor E. J. Ashbaugh, Ohio State University, Columbus, Ohio.

The Bureau of Experimental Education at the Chicago Normal College, under the direction of Dr. D. L. Geyer, has been engaged during the past year in investigating: (1) the value of the picture-story reading lessons devised by Courtis and Smith, (2) the value of Courtis' standard practice tests in handwriting, (3) the value of the Horn-Ashbaugh speller, (4) the value of the Winnetka individual arithmetics, and (5) the intelligence of prospective teachers registered in the Chicago Normal School.

Professor Ralcigh Schorling of the University of Michigan has been promoted to supervisor of instruction in the University of Michigan High School. He will have charge of directed teaching in the high school and in cooperating schools and will be chairman of the course, Special Methods, in the School of Education. H. H. Ryan, principal of the Ben Blewett School, St. Louis, Missouri, succeeds Professor Schorling as principal of the University High School.

Dr. W. J. Osburn, director of educational measurements for the State of Wisconsin, during a leave of absence, has been supervising an investigation for the Commonwealth Fund. The investigation has to do with the amount of overlapping which the members of freshmen classes for the year 1925-26 have experienced since they entered the elementary school. The study centers mostly in the states which have prescribed textbooks in the elementary and secondary schools and is restricted to basal texts only.

A survey of the civic properties and public management of the school system of Berkeley, California, is being carried out under the direction of a survey commission consisting of William J. Cooper, superintendent of city schools, Fresno, California; Andrew S. Hill, assistant superintendent of schools, San Jose, California; Dr. Herbert R. Stoz, state director of physical education, Sacramento, California; Chester Rowell, Pasadena; and Dr. Jessie B. Sears, Stanford University, who is in charge of the survey.

A handbook for committees on courses of study has been prepared by Rudolf V. Lindquist for the teachers of Oakland, California. The new

emphasis upon cooperation in the development of courses of study has necessitated placing in the hands of teachers some outline of the method for constructing such courses. The handbook was published to meet this need. Instructive details and suggestions are given to these committees. Even such items as preparation of the manuscript for submission to the council of supervision are carefully considered.

One more contribution to the extensive literature on one-room and consolidated schools is found in the 1925 volumes of Teachers College, Columbia University, Contributions to Education. It is called *One-Room and Consolidated Schools of Connecticut*, by Emil L. Larson, and reports a comparative study of teachers, costs, and holding power for these two types of schools. The general conclusions for Connecticut are that the cost of education is not greater in consolidated schools than in one-room schools, that the holding power of consolidated schools is superior, and that the teachers in these schools have more training and experience.

Superintendent Carleton W. Washburne, of the public schools of Winnetka, Illinois, is announcing a mimeographed experimental edition of individual algebra by C. N. Stokes, instructor in mathematics, New Trier township high school. The material is offered at cost to schools willing to report their success or failure with the method, and their specific suggestions regarding the improvement of the material. The subject-matter is in small work units, emphasizes the practical application of algebra to real problems, and is self-instructive and self-corrective.

Using and Interpreting Standards Tests (University of Iowa Bulletin, College of Education, Series, No. 15) by H. A. Greene and A. N. Jorgensen carries the subtitle "A Handbook for the Classroom Teacher." The bulletin contains 36 pages and is concerned with the following topics: the meaning and utility of tests, use of the tests in the classroom, the results of testing, interpretation of the results of testing, and corrective teaching to follow testing.

During December, 1925, about 37,000 Stanford Achievement Tests were given in Buffalo. An extensive mimeographed bulletin gives the results and a discussion of their significance. The results indicate need for more careful grading in order that pupils may do work in accordance with their ability. Definite suggestions are given for remedial work in reading, arithmetic, language, and spelling.

The Bureau of Research at Baltimore, Maryland, has recently published the first of a new series of research monographs. The title is *Improvement in the Teaching of Reading*. Most of the monograph has been contributed by investigators in reading throughout the country. Some of the topics discussed are: "Keynotes to modern reforms in the teaching of reading," "Contribution of the kindergarten to beginning reading," "Reading from books in the first grade," "Phonetics for the slow reader in the primary grade,"

"Effect of the physical make-up of a book upon children's selection," "Measurement, diagnosis, and remedial treatment in reading," and "Meeting individual needs in reading."

During the meeting of the Inland Empire Teachers Association at Spokane, April, 1926, a section on educational research was organized. Formerly this work had been distributed among the other sections of the Association. Those interested in the field of educational research, however, felt that the time had arrived for the establishment of a section devoted entirely to this field. The Association includes Oregon, Washington, Idaho, and Montana. Dr. I. N. Madsen of the Idaho State Normal School at Lewiston was elected president and Dr. A. R. Lang of the State Normal School at Cheney, Washington, was elected secretary of the new research section.

An age-grade survey conducted by the Research Department of the public schools of Kalamazoo, Michigan, revealed that three-fourths of the school population were in the right grades for their chronological ages. A comparison with a similar survey in 1915 shows that the median ages of the pupils in the various grades are less than they were in 1915, in every case except the first and the sixth grades. The median age of the school enrollment is a little over eight months older than in 1915. In 1915, 11.5 percent of the total enrollment were in the first grade and 2.1 percent in the twelfth, while the present survey shows 9.2 percent and 3.8 percent respectively.

The May issue of *Current Methods* reports the study of the teaching of current events in normal schools, teachers' colleges, and schools of education. The article is full of interest for those who consider this subject of first-rate importance. On the basis of one hundred forty-two institutions replying to the questionnaire, thirty-five offer separate courses in current events, and the same number give no attention to the preparation of their students to teach the subject. Division of time between content and method, amount of time in terms of length of recitation period and number of weeks, periodicals and other means used for this type of work, and the opinions of individuals regarding the grades in which current events should be taught, are all discussed in some detail with reference to normal schools and liberal-arts colleges.

The Cleveland Schoolmasters' Club committee on science research published its report for last year in the *Journal of Chemical Education* (Vol. III, No. 3), March, 1926. For the coming year, the committee, which consists of principals, teachers, and members of the School of Education staff, is beginning a study of science in the elementary and junior high schools. It has undertaken to state objectives in science from the kindergarten through the sixth grade. Some of the details of the study are: (1) an analysis of present objectives as given in textbooks, courses of study, and curriculum investigations, (2) an analysis of the questions and activities of children, (3) an analysis of the questions in science asked by adults, and (4) a systematic analysis of environment. The objectives obtained in one study will be checked against the

objectives obtained in the other studies. In this way, adequate attention will be given to the existing materials, pupils' interests and activities, and adult interests. The analysis of the environment should reveal any important elements neglected by the other studies.

An analysis of the arithmetic testing program in West Allis, Wisconsin, reveals the following outstanding facts: (1) there was difficulty in handling zero in all operations; (2) the horizontal arrangement of a problem caused considerable confusion in addition and subtraction but practically none in multiplication and division; (3) long column addition appeared to be more difficult for these children than for the children used in standardizing the test; (4) carrying was difficult for the lower grades; (5) denominate numbers proved difficult, due to the fact that they occur unusually late in the West Allis course of study; (6) borrowing was a real problem for the lower grades; (7) subtraction of simple fractions caused as much trouble for these children as did the subtraction of mixed numbers; (8) mixed numbers were harder to handle in multiplication than decimal fractions; (9) the use of two numbers in the dividend, one being indivisible, was a source of difficulty for the children in the lower grades; (10) the use of the sign caused little or no added difficulty in multiplication or division; (11) the example with one as a quotient caused unusual difficulty for the upper-grade children; (12) two zeros occurring together in the quotient caused real difficulty for all grades.

Dr. G. M. Ruch has resigned his position at the University of Iowa to go to the University of California as Professor of Educational Psychology. During the summer he taught at the University of Chicago. Under a grant of $2,500 from the Commonwealth Fund, Dr. G. M. Ruch has investigated the value of existing tests and examinations in social studies and the possibilities for their improvement. The report of this study will be published by Scott, Foresman and Company.

Dr. Harold F. Clark, associate professor of education at Indiana University has been granted leave of absence for a year to pursue advanced study in economics and finance in the University of London. The necessity of bringing to the aid of school administration all that the fields of economics and finance can contribute has not been sufficiently understood. A deeper and more adequate appreciation of this is essential in educational service.

Dr. William M. Proctor, of Leland Stanford University, is working on the problem of relative values of different types of high-school curricula for college preparation. He is classifying Stanford entrants for the year 1921-22 as to the types of the high-school subjects taken by them. That is, he is determining whether the high-school curricula of these entrants were predominantly academic or contained as much as twenty-five percent of vocational subjects. The total accomplishment in the university will be taken into account in measuring the relative merits of these two types of preparation. Approximately seven hundred

cases are available on which a full four-year record, including preliminary examinations, intelligence scores, and university marks, will be used.

Learning to Study is the title of a little brochure by G. C. Brandenburg, professor of educational psychology of Purdue University, which has recently come to our attention. Issued by the authority of the president of the university, it is intended especially to help Freshmen adjust themselves to the university study schedule.

A four-page pamphlet containing study helps for the fifth grade has been distributed to students by Superintendent Caldwell of Hammond, Indiana. Each of these publications calls attention to certain fundamental facts regarding study which should be known and utilized by students of all grades.

The Chicago Principals' Club Service Bulletin, Number Five, presents the argument of the Chicago Board of Education for an increased school tax rate. It shows that the school board which has been piling up an increasing deficit for a number of years, has approached the place where the borrowing power has been practically passed. The following pertinent paragraphs illustrate the seriousness of the situation:

If kindergartens were discontinued at the end of the present year, it would be possible to finance the schools through 1927, but not through 1928.

If the school year were reduced from ten months to nine months, it would be possible to continue the present educational program through 1928, but not through 1929.

If the last two years of high-school work were discontinued after this year, it would be possible to finance the schools through 1928, but not through 1929.

Educational journalism, particularly as it relates to school administration, has been enriched by a new German periodical, *Monatschrift für das gesamte Schulwesen*, the first issue of which appeared in January, 1926. It is published by G. Freytag of Leipzig and edited by Doctor Max Kullnick, *Direktor, staatlichen Auskunftstelle für Schulwesen*, Berlin. As suggestive of the scope of this periodical, we offer in a free translation the topics which appear in the table of contents of the April number: List of textbooks which have been officially adopted in Prussia since 1923; (a) textbooks for the higher schools, (b) textbooks for the middle schools; School legislation in Germany; Judiciary decisions on school questions; Regulations in Germany concerning compulsory attendance at continuation schools; Foreign educational news; Questions and answers; Recent publications; Foreign publications; Noteworthy books. In a recent letter, Doctor Kullnick expresses the hope that the new periodical will prove one more contribution towards better understanding between our countries.

Harriet M. Barthelmess reports the results of "A Study of Teaching Load in Normal Schools," made by the New Jersey Normal-School Teachers' Association, 1923-26. In addition to summarizing data and recommendations from similar surveys made in the normal schools of Michigan, Massachusetts, and Louisiana, the report makes a tabular comparison of teacher-load in the New

Jersey Normal Schools with the median teaching-load in seventy-five normal colleges as reported by the Committee on Standards of the American Association of Teachers Colleges. No marked differences were found to exist.

Among other significant facts brought out are the following: (1) The teaching-load is considerably higher in normal colleges than in other professional schools, private colleges, or state universities. (2) Light teaching schedules do not indicate that teachers are doing little professional work. (3) Teaching-loads among teachers doing the same kinds of work range widely. The report includes definite recommendations regarding the teaching-load in relation to the type of work each teacher is doing.

To investigate the problem, "What is the relationship between cutting class in a given course, and class rank in that course?" careful records of tardies and absences were kept for a class of fifty-four junior and senior students taking a course in the Principles of Secondary Education at Northwestern University. The students of this same class were ranked from first to fifty-fourth on the basis of their scores in three objective examinations totaling 225 questions. The questions were all of the true-false, multiple-response, completion, best-answer, identification, matching, or simple recall varieties. The estimates of the instructor had no influence on the ranking of the students. The findings were as follows:

		Total Number of Tardies	Total number of Absences
A.	Lowest ten percent (students ranking 50-54)	9	20
	Highest ten percent (students ranking 1-5)	2	4
B.	Fourth quartile (students ranking 42-54)	26	50
	First quartile (students ranking 1-13)	12	16

C. Correlating the number of cuts with the average ranks for the number of cuts (seven, six, five, etc.) gave a coefficient of $r = -0.90$.

D. A loose interpretation from scanning the average ranks found at each level, that is, one cut, two cuts, etc., seems to show that, on the average, every time a student cut a class, two other students slipped ahead of him in class rank or class standing.

Secretary Chicago Principals' Club DON C. ROGERS

A Study of the Relative Values of Two Methods of Equal-Ability Grouping

Frequent discussions have arisen among high-school counsellors and directors of research concerning the relative values of the intelligence quotient and the raw score as a means of segregating in-coming high-school Freshmen in equal-ability groups. In order that the question might have a more statistical answer than has thus far been available this investigation was undertaken.

The raw score and the intelligence quotient derived from the Terman Group Test of Mental Ability were used in this study. With each of them was correlated the pupil's school mark. School marks may or may not properly estimate success in studies, but however this may be, they represent at present the best available estimate of school success. Accordingly the correlation coefficients between marks and intelligence quotients and between marks

and raw scores were studied. The marks used were those received in "solids" during the first semester in high school. By "solids" are meant those courses which contribute one unit per year of the required sixteen units for graduation. In the particular high school in which this investigation was conducted these courses were: English, modern language, Latin, algebra, general science, ancient history, and in one or two cases a shop or commercial subject that was generally undertaken later in the course.

The first-semester Freshmen whose cases were investigated were for the most part of English and north European parentage; no Orientals and no Negroes were included. Judged by the cars, clothes, social affairs, and general conversation of the student body, the families represented were in comfortable circumstances. The median intelligence quotient for the whole school over a period of three years was about 102 with a semi-interquartile range of ± .10. These facts would seem to indicate that the group in question was a fairly representative one.

The marks used were evaluated as follows: 1, very superior; 2, superior; 3, average; 4, inferior; and 5, failure. The marks of 1 and 2 only are considered a recommendation to college. The distribution of intelligence quotients and school marks is given in Table I and of raw scores and marks in Table II.

TABLE I. DISTRIBUTION OF INTELLIGENCE QUOTIENTS AND SCHOOL MARKS

School Marks	Intelligence Quotients			
	125	110	90	75
(1)	(2)	(3)	(4)	(5)
1	128	169	259	30
2	100	297	618	110
3	43	198	651	224
4	10	58	234	105
5	9	40	192	98

Number of cases = 3,573
S. D. intelligence = .90
S. D. marks = .84
r = 0.355 ± .01 (Pearson)

The coefficients of correlation, 0.355 for intelligence quotients and school marks and 0.344 for raw scores and school marks, may appear to be low, but it should be remembered that these students were under high-school methods for the first time. Furthermore, other studies of a somewhat similar nature, which have been reported from time to time, indicate that there are many factors in failure beside the type of mentality measured by intelligence tests.

The striking fact is the insignificant difference between the coefficients. Not only are the coefficients almost numerically the same but the probable errors overlap, showing a fifty-fifty chance that the two coefficients would tend to be equal. In view of the fact that the testing of in-coming Freshmen generally occurs at a time when the clerical rush is at its height, the results

of these findings would suggest a way to save some time and extra work. The pupil may be placed using the raw score on the test as the first means of classification, and readjustment may be made later, when necessary, taking into account the pupil's score, intelligence quotient, achievement, and any other factors which may seem desirable.

TABLE II. DISTRIBUTION OF RAW SCORES AND MARKS

Marks	Raw Scores							
	175	150	125	100	75	50	25	0
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	19	113	155	188	102	24	4	.....
2	18	93	238	390	251	103	17	3
3	11	55	149	353	341	190	36	10
4	5	12	38	138	129	68	13	.....
5	2	17	27	75	122	63	13	5

Number of cases = 3,573
S. D. intelligence = .895
S. D. marks = .884
$r = 0.344 \pm .01$ (Pearson)

We may conclude:

1. That the correlation coefficient between the pupils' school marks in LX-B solids and their intelligence quotients was approximately that between their school marks and their raw scores on the Terman Group Test, namely 0.355 and 0.344, respectively.

2. From these findings it appears that the intelligence quotient and the raw score in this test are about equally valuable as a means of classifying Freshmen when they are entering high school.

Franklin High School, Los Angeles HARRY GILBERT

Colorado Research Foundation

In February, 1926, a sum of money known as the "Colorado Research Foundation," privately subscribed, was set aside for the purpose of investigating the opportunities for secondary education in Colorado. The Research Committee of the Colorado State Teachers College was organized to carry on the work with Doctor F. L. Whitney, director of educational research in that institution, as chairman.

This group made a preliminary report in May, which includes a history of the project and an outline of the method employed. The plan includes: (1) a checking of the eighth-grade groups of the school year 1924-25; (2) an intensive study of sixth-, eighth-, ninth-, and twelfth-grade groups as well as the status in age, grade, and progress for all pupils in representative situations during the school year 1925-26; and (3) an identification during the first

school months of 1926-27 of all eighth-grade pupils of the previous school year in terms of their educational and vocational destination.

Results, of a preliminary investigation concerning the present location of each eighth-grade pupil during 1924-25 in school or in industry, make up the bulk of the report. The forms used to collect information call for the name of each pupil, the type of school attended, the present location of the pupil, what he is doing, the amount of his monthly earnings, and the reason for non-attendance at school this year. This aspect of the investigation deals with the eighth-grade pupils, promoted in 1925, who are not now attending school. A similar study was made as to reasons for the non-attendance of 312 children in eleven representative counties, who failed to be promoted. Subsequent reports of the committee will deal with the other two phases of the investigation.

New Tests

The Brown-Woody Civics Test, recently published by the World Book Company, is designed to obtain an objective measurement of the achievement of high-school students in civics. It may also be used to some extent in the elementary and junior high schools. Of the three parts to the test: Part I is a civic-vocabulary test of forty words considered necessary for the intelligent reading and understanding of civics; Part II is a civic-information test of eighty questions covering the various units of government; Part III is a civic-thinking test of nine exercises which provides for the application of civic principles to practical civic situations.

The Educational Personnel Publishing Company of Washington, D. C., has recently published the following tests: (1) General Classification Test, senior grade for high-school Seniors and college Freshmen; (2) General Classification Test, junior grade, for grades VII, VIII, IX, X, and XI; (3) General Classification Test, grade one, low-grade practical test for adults; (4) Mechanical-Aptitude Test, junior grade; (5) Mechanical-Aptitude Test, clerical problems, junior grade; (6) Clerical-Aptitude Test (reasoning test), junior grade; (7) Ingenuity Test, I, for junior and senior high schools, colleges, and industries; and (8) Ingenuity Test, II, for senior high schools, colleges and industries.

The Research Service Company, 4259 South Van Buren Place, Los Angeles, California, has published the following tests: (1) Los Angeles Diagnostic Tests, Fundamentals in Arithmetic for grades II-VIII, revised by Caroline Armstrong and Willis W. Clark; (2) Los Angeles Primary Reading Test, grades I-III, revised by Jessie E. Ingraham; (3) Los Angeles Elementary Reading Test, grades III-IX, revised by Jessie E. Ingraham; (4) Sentence Vocabulary Test, grades III-IX, revised by Caroline Armstrong and Cora L. Danielson; (5) Primary Word Recognition Test, grades I and II; (6) MacQuarrie Test for Mechanical Ability, devised by T. W. MacQuarrie.

The Public School Publishing Company of Bloomington, Illinois, will have ready for distribution this fall a new type of intelligence test devised by P. R. Stevenson, Bureau of Educational Research, Ohio State University.

These tests are for grades IV to VI and for grades VII to XII. Unlike other tests, this series may be used many times. All of the answers are written on an inexpensive sheet of paper; nothing is written upon the printed material. Three forms of the test are applicable for grades IV through VI and are bound together in the form of a booklet. Three forms are also applicable for grades VII through XII and are bound together in a separate booklet. A small school system can buy enough tests for the largest class and use the same material for all the pupils. Larger school systems may need a set of forty or fifty for each of two or three large schools. There is no reason why the test materials should not be used for several years before they are worn out. These tests should mean considerable saving to boards of education from the money point of view and to teachers in the time saved in scoring the tests.

A test to show the individual difficulties in the fundamental processes in arithmetic has been devised by G. T. Buswell and Lenore John. This test is accompanied by a diagnostic chart and a manual of directions. It is published by the Public School Publishing Company of Bloomington, Illinois.

A test of letter writing has been devised by F. Leslie Clark of the Kansas City School System and is published by the Public School Publishing Company.

Two tests on civics, one devoted to civic information and the other to civic attitudes have been devised by Howard C. Hill. They are published by the Public School Publishing Company of Bloomington, Illinois.